

CALIFORNIA HIGH-SPEED TRAIN

Project Environmental Impact Report /
Environmental Impact Statement

Merced to Fresno Section High Speed Train Project EIR/EIS

Summary

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CALIFORNIA
High-Speed Rail Authority



U.S. Department of Transportation
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Summary

S.1 Introduction and Background

The California High-Speed Rail Authority (Authority), a state governing board formed in 1996, has responsibility for planning, designing, constructing, and operating the California High-Speed Train (HST). Its mandate is to develop a high-speed rail system coordinating with the state's existing transportation network, which includes intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports.

High-Speed Train System

The system that includes the HST guideways, structures, stations, traction-powered substations, and maintenance facilities.

The California HST System will provide intercity, high-speed service on more than 800 miles of guideway throughout California, connecting the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. Figure S-1 shows this system. It will use state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology, including contemporary safety, signaling, and automated train-control systems, with trains capable of operating up to 220 miles per hour (mph) over a fully grade-separated, dedicated guideway alignment.

The Authority plans two phases. Phase 1¹ will connect San Francisco to Los Angeles/Anaheim via the Pacheco Pass and the Central Valley with a mandated express travel time of 2 hours and 40 minutes or less. Phase 2 will connect the Central Valley to the state's capital, Sacramento, and will extend the system from Los Angeles to San Diego.

The Merced to Fresno HST Section, shown in Figure S-2, is a critical Phase 1 link connecting the Bay Area HST Section to the Fresno to Bakersfield, Bakersfield to Palmdale, and Palmdale to Los Angeles HST sections. The Merced to Fresno Section includes HST stations in the cities of Merced and Fresno. These stations are this section's beginning and ending points, or project termini. If the Castle Commerce Center, located north of Merced, were selected from the five alternative sites for the heavy maintenance facility (HMF), the project's northern boundary would be north of Merced, at that HMF. Both the connection west to San Francisco and the HMFs are studied in the Merced to Fresno Section EIR/EIS, but the decisions on these portions of the project have been postponed until after the Fresno to Bakersfield and the San Jose to Merced Sections complete their environmental reviews. This Merced to Fresno Section EIR/EIS does identify the preferred north-south route, as summarized in Section S.10.

S.2 Tiered Environmental Review: Final Statewide Program EIR/EIS and Merced to Fresno Section Project EIR/EIS

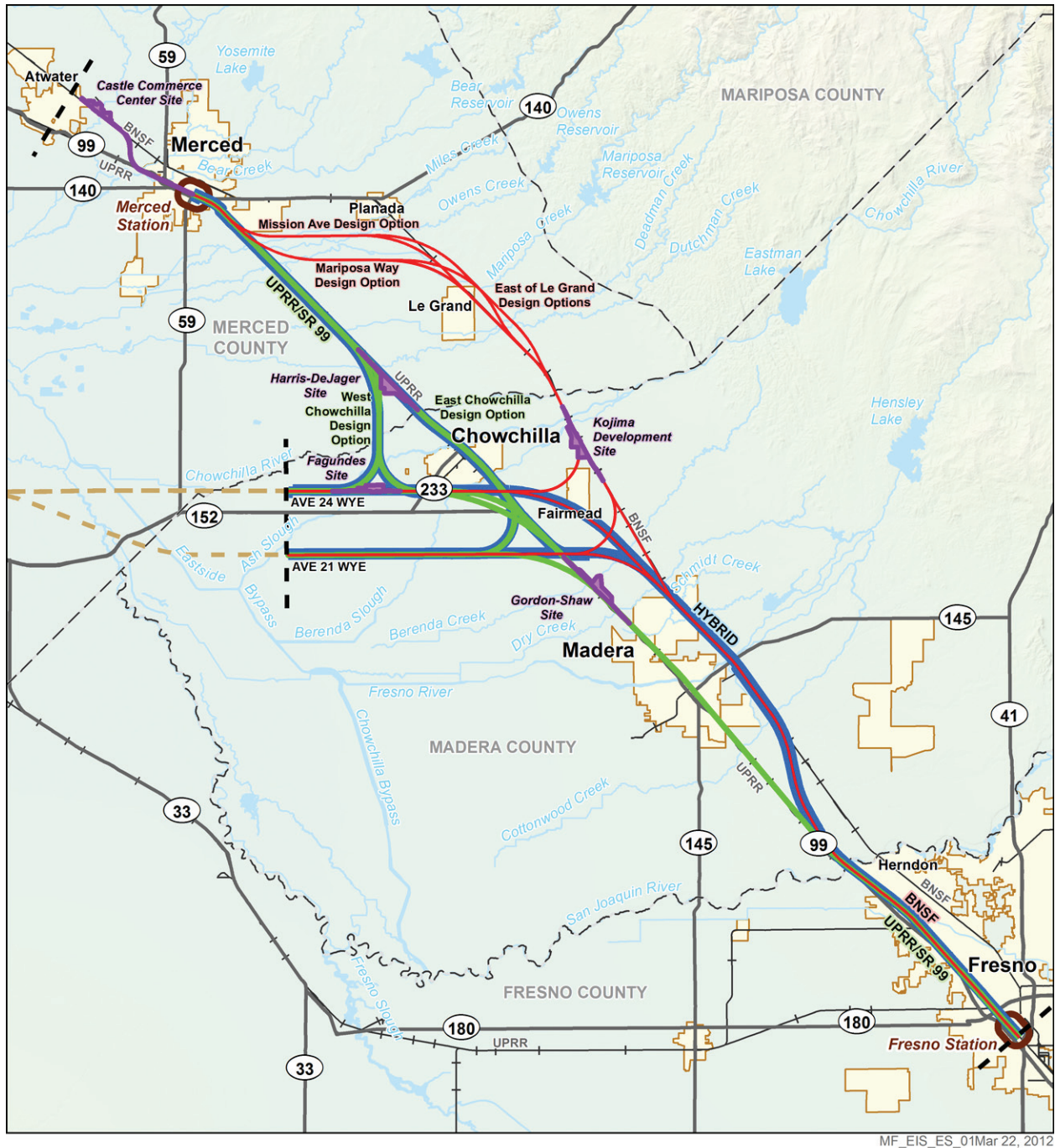
The Council on Environmental Quality provides for National Environmental Policy Act (NEPA) decision-making through a phased process. This process is referred to as *tiered* decision-making. This phased decision-making process provides for a broad level programmatic decision to inform more specific decisions using a tiered approach. A first tier programmatic environmental impact statement (EIS) addresses one large project with one overall purpose and need that would be too extensive to analyze in a traditional project EIS. The California Environmental Quality Act (CEQA) also encourages tiering and also provides for first-tier and second-tier EIRs.

The Merced to Fresno Section Project Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) is a second-tier EIR/EIS that builds upon and further refines work completed earlier as part of the two first-tier program EIR/EIS documents. The 2005 *Final Program EIR/EIS for the Proposed California High-Speed Train System* (Statewide Program EIR/EIS) provided a first-tier analysis of the

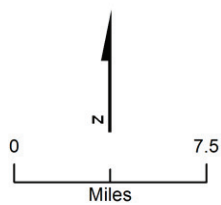
¹ Phase 1 would be built in stages dependent on funding availability.



Figure S-1
California HST System Initial Study Corridors



MF_EIS_ES_01Mar 22, 2012



- BNSF Alternative
- UPRR/SR 99 Alternative
- Hybrid Alternative
- Project Limit
- Connection to Other Section
- Station Study Area
- Potential Heavy Maintenance Facility
- City Limit
- County Boundary
- Railroad
- State / US Highway

Figure S-2
Merced to Fresno Section Alternatives
and Design Options

general effects of implementing the HST System across two-thirds of the state. The *Final Bay Area to Central Valley HST Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS)* (Authority and Federal Railroad Administration [FRA] 2008), and the *Bay Area to Central Valley HST Revised Final EIR* (Authority 2010) were also first-tier and programmatic documents but focused on the Bay Area to Central Valley region. As a result of CEQA litigation, the Authority rescinded its 2008 programmatic decision, prepared a Revised Final Program EIR, and made a new decision on the Bay Area to Central Valley route in 2010. A second legal challenge resulted in the Authority preparing a Partially Revised Final Program EIR. The Authority is expected to rescind its 2010 decisions and make a new set of decisions for the Bay Area to Central Valley connection prior to considering the Merced to Fresno HST Project Final EIR/EIS. The Authority's rescission of the 2008 and 2010 programmatic decisions does not invalidate FRA's federal decisions on the 2005 and 2008 Program EIR/EISs.

These first-tier EIR/EIS documents provided the Authority and FRA with the environmental analysis necessary for evaluation of the overall HST System and for making broad decisions about general HST alignments and station locations for further study in second-tier EIR/EISs. These documents are available on the Authority's website: www.cahighspeedrail.ca.gov. The Merced to Fresno Section Project EIR/EIS analyzes the environmental impacts and benefits of implementing the HST in the more geographically limited area between Merced and Fresno and is based on more detailed project planning and engineering. The analysis therefore incorporates the earlier decisions and program EIR/EISs, and it provides more site-specific and detailed analysis. For the HST System, including the Merced to Fresno Section, FRA is the lead federal agency for compliance with NEPA and other federal laws. The U.S. Army Corps of Engineers (USACE) agreed by letter, dated December 30, 2009, to participate as a cooperating agency under NEPA. In January 2012, the Bureau of Reclamation requested to participate as a cooperating agency under NEPA (Johnson 2012). The Authority is serving as a joint-lead agency under NEPA and is the lead agency for compliance with CEQA.

S.3 Issues Raised During the Scoping Process

The Authority held three public scoping meetings between March 18 and March 26, 2009, in the Merced to Fresno Section project corridor, with 270 people attending the three meetings. Scoping helps determine the focus and content of an EIR/EIS. The Authority and FRA received a total of 144 comments from individuals and organizations, as well as comments from 31 agencies, on the proposed project. The following list includes major issues identified during the scoping process:

- Location of stations
- Location of the HST alignment
- Location of the proposed HMF
- The benefits of the HST, including those related to air quality, congestion relief, and economic development
- Connections to local transit
- General support for the project
- Fast-tracking of the project
- Agricultural impacts
- Natural resource impacts
- Noise impacts
- Rail consolidation
- Power source and requirements of the system
- Economic growth issues
- Use of U.S. labor and U.S. products for HST construction
- Employment opportunities
- Ridership estimates
- Property acquisition
- Displacement of people
- Potential devaluation of property
- Benefits/impacts on local businesses
- Questions about cost and financing

S.4 Purpose of and Need for the HST System and the Merced to Fresno HST Section

S.4.1 Purpose of the HST System

The purpose of the statewide HST System is to provide a reliable high-speed electric-powered train system that links the major metropolitan areas of the state, and that delivers predictable and consistent travel times. A further objective is to provide an interface with commercial airports, mass transit, and the highway network and to relieve capacity constraints of the existing transportation system as increases in intercity travel demand in California occur, in a manner sensitive to and protective of California's unique natural resources.

S.4.2 Purpose of the Merced to Fresno Section

The purpose of the Merced to Fresno Section is to implement the Merced to Fresno Section of the HST System to provide the public with electric-powered high-speed rail service that provides predictable and consistent travel times between major urban centers and connectivity to airports, mass transit systems, and the highway network in the southern San Joaquin Valley, and to connect the northern and southern portions of the system.

S.4.3 Objectives and Policies for the HST System in California and within the Central Part of the San Joaquin Valley Region

The Authority has responded to its mandate to plan, build, and operate an HST system that is coordinated with California's existing transportation network by adopting the following objectives and policies for the proposed HST System:

- Provide intercity travel capacity to supplement critically overused interstate highways and commercial airports.
- Meet future intercity travel demand that will be unmet by present transportation systems, and increase capacity for intercity mobility.
- Maximize intermodal transportation opportunities by locating stations to connect with local transit systems, airports, and highways.
- Improve the intercity travel experience for Californians by providing comfortable, safe, frequent, and reliable high-speed travel.
- Provide a sustainable reduction in travel time between major urban centers.
- Increase the efficiency of the intercity transportation system.
- Maximize the use of existing transportation corridors and rights-of-way, to the extent feasible.
- Develop a practical and economically viable transportation system that can be implemented in phases by 2020 and generate revenues in excess of operations and maintenance (O&M) costs.
- Provide intercity travel in a manner sensitive to and protective of the region's natural and agricultural resources and reduce emissions and vehicle miles traveled for intercity trips.

The approximately 65-mile-long Merced to Fresno Section is an essential part of the statewide HST System. The Merced to Fresno Section is the location of the connection between the Bay Area and Sacramento branches of the HST System; it will provide Merced and Fresno access to a new transportation mode and will contribute to increased mobility throughout California. This section will

connect the central San Joaquin Valley region to the remainder of the HST System via Merced County, Madera County, and the northern part of the city of Fresno (refer to Figure S-1).

S.4.4 Need for the HST System Statewide and within the Central San Joaquin Valley Region

The need for an HST system exists statewide, with regional areas contributing to this need. The Merced to Fresno Section is an essential component of the statewide HST System.

The capacity of California's intercity transportation system, including the central part of the San Joaquin Valley region, is insufficient to meet existing and future travel demands. Without the proposed project, the current and projected future system congestion will continue to result in deteriorating air quality, reduced reliability, and increased travel times. The current transportation system has not kept pace with the increases in population, economic activity, and tourism within the state, including those in the central part of the San Joaquin Valley region. The interstate highway system, commercial airports, and conventional passenger rail system serving the intercity travel market are operating at or near capacity and will require large public investments for maintenance and expansion to meet existing demand and future growth over the next 25 years and beyond. Moreover, the feasibility of expanding many major highways and key airports is uncertain; some needed expansions might be impractical or are constrained by physical, political, and other factors. The need for improvements to intercity travel in California, including intercity travel between the central part of the San Joaquin Valley, the Bay Area, Sacramento, and Southern California relates to the following issues:

- Future growth in demand for intercity travel, including the growth in demand within the central part of the San Joaquin Valley region.
- Capacity constraints that will result in increasing congestion and travel delays, including those in the central part of the San Joaquin Valley region.
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California, including the central part of the San Joaquin Valley region.
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state, including the central part of the San Joaquin Valley region.
- Poor and deteriorating air quality and pressure on natural resources and agricultural lands as a result of expanded highways and airports and urban development pressures, including those within the central part of the San Joaquin Valley region.

Geographically, the Merced to Fresno Section is located in the center of California. This region significantly contributes to the statewide need for a new intercity transportation service that would connect it with the major population and economic centers and to other regions of the state. The major population, economic, and political centers are located on the coasts of Northern and Southern California and in the Sacramento Valley.

S.5 Alternatives

This section summarizes the alternatives evaluated in the Merced to Fresno Section Project EIR/EIS. The Statewide Program EIR/EIS (Authority and FRA 2005), the Bay Area to Central Valley Program EIR/EIS (Authority and FRA 2008), public and agency input from the scoping process, extensive local and agency involvement during Technical Working Group (TWG) meetings, and other stakeholder meetings provided input to the Authority in developing these alternatives. Meetings included city and county staff and other local-level agency staff.

All components of the alternatives have been evaluated during an alternatives analysis screening process, which considered the effects of the alternatives on the social, natural, and built environment. Some portions of the Merced to Fresno Section overlap other HST sections; therefore, the analysts performed the screening in collaboration with teams for the adjacent San Jose to Merced, Fresno to Bakersfield, and Sacramento to Merced sections. In addition to the HST alternatives, a No Project Alternative and HMF alternatives were studied. The HMF will support the assembly, testing, commissioning, and acceptance of high-speed train vehicles (rolling stock) prior to the start-up of operations. After initial operations begin, the HMF will assume maintenance and major repair functions to sustain the regular system operation and assembly of new rolling stock.

S.5.1 No Project Alternative

The No Project Alternative is the basis for comparison of the project alternatives. The No Project Alternative represents the state's transportation system (highway, air, bus, conventional rail) as it is currently and as it would be after implementation of programs or projects that are currently projected in regional transportation plans (RTPs), have identified funds for implementation, and are expected to be in place by 2035, as well as any major planned land use changes. The entire San Joaquin Valley is projected to grow at a rate higher than any other region in California. The three counties—Merced, Madera, and Fresno—are projected to continue to grow at an average rate of 3% per year. By 2035, the population in the study area is projected to grow from 1,365,911 to 2,298,075, for a net increase of 932,164 people or 60%. Accommodating this new population would require land acquisition and the construction of new infrastructure, including roadways, electric power generation, water and wastewater facilities, schools, hospitals, and commercial and industrial facilities. To support this growth, development would consume an estimated 91,000 acres because, according to current planning trends, these counties would develop at a density of approximately 10 persons per acre.

S.5.2 Merced to Fresno Section High-Speed Train Alternatives

This Project EIR/EIS evaluates three HST north-south alignment alternatives: the UPRR/SR 99 Alternative, the BNSF Alternative, and the Hybrid Alternative (the Hybrid Alternative is a combination of the UPRR/SR 99 Alternative and the BNSF Alternative). Figure S-2 shows the three north-south alignment alternatives carried forward in this Project EIR/EIS. They would extend between and include the proposed Downtown Merced Station and the Downtown Fresno Station, with an estimated trip time of 25 minutes between Merced and Fresno. The Merced and Fresno stations would see a mix of stopping trains and through trains; the number of trains would peak for the full system, when both Phase 1 and Phase 2 are in operation. Scenarios were developed to take into account various levels of ridership that could occur. In 2035 for the high ridership scenario, the full system would see as many as four trains per hour stop at Fresno in each direction at the peak, and six trains run through the city without stopping. At the off-peak, the same number of stops would be made, but the through trains would decrease to three per hour. At Merced, three trains would stop each hour per direction at the peak, with two running through. At the off-peak, both of the hourly trains would stop at Merced.

The April 2010 Preliminary Alternatives Analysis Report described the alternatives identification process for the UPRR/SR 99 and BNSF alternatives (Authority and FRA 2010b). The HST alternatives are identical in the Merced and Fresno vicinities. The main difference between the initial UPRR/SR 99 and BNSF alternatives is that the UPRR/SR 99 Alternative generally follows the UPRR and SR 99 transportation

corridor, which connects the cities of Merced, Chowchilla, Madera, and Fresno. The BNSF Alternative follows the BNSF corridor, which travels east from Merced through Planada, Le Grand, and Madera Acres, and then veers back west to reconnect with the UPRR/SR 99 Alternative again before entering the city of Fresno. Supplemental alternatives analyses resulted in the development and evaluation of the Hybrid Alternative which would use portions of the UPRR/SR 99 and BNSF alternatives and their design options (Authority and FRA 2010b). The Hybrid Alternative follows the UPRR/SR 99 Alternative alignment near Merced and the BNSF Alternative alignment near Madera Acres.

All three north-south alignment alternatives include design options in some areas to avoid or minimize impacts and alternative HST wye connections and three east-west alignments (along Avenue 24, Avenue 21, and SR 152) that would connect this section with the San Jose to Merced Section. The western boundary for these east-west alignments and wyes is approximately Road 8, west of Chowchilla. The eastern boundary is the BNSF Alternative alignment.

The Authority developed the SR 152 Wye with connections to all three north-south alignment alternatives, as shown in Figure S-3, to a conceptual-level alignment to be consistent with Caltrans planning, the SR-152 Freeway Agreement, and HST engineering criteria. The three wye configurations are evaluated and compared in the *SR 152 Alternatives Analysis* (available on the Authority's website at www.cahighspeedrail.ca.gov).

The SR 152 Freeway Agreement, signed by Madera County and Caltrans, identifies six locations for future interchanges with intermediate roads either separated with underpasses or closed. The HST alignment was offset approximately 400 feet from the freeway south right-of-way to the HST northern right-of-way line to accommodate the future planned improvements to SR 152.

The Avenue 21 and Avenue 24 east-west alignments and wyes have been studied in detail in this Project EIR/EIS (see Figure S-2). Based on input from regulatory agencies, the SR 152 east-west alignment and related wyes (Figure S-3) have been determined to merit detailed study as well, which will be done in the San Jose to Merced Project EIR/EIS. The Merced to Fresno Section Project EIR/EIS will be used for the Authority and FRA to make decisions about the north-south alignment. All three east-west connections and wyes will be carried forward for additional study, consideration, and decision-making as part of the San Jose to Merced Section Project EIR/EIS process.

S.5.3 Station Area Development

The presence of an HST station would provide tremendous opportunities to revitalize the downtowns of Merced and Fresno through urban design; diversity of higher density mixed use development; and improved access to transit, bike, and pedestrian connectivity. The higher densities in the station areas would result in higher levels of transit and the stations could become

Wye Connection

A wye is where train guideways branch off from a main line to continue in different directions, forming a "Y"-like shape. In this case, the two guideways traveling east-west must become four guideways: a set of two guideways branching northbound and a set of two guideways branching southbound.

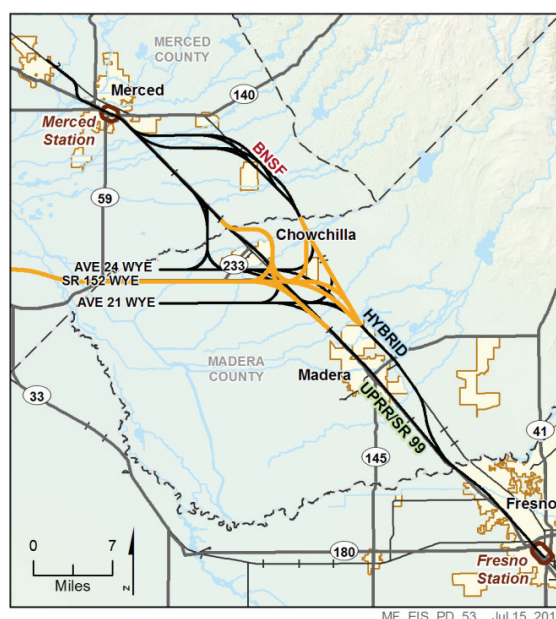
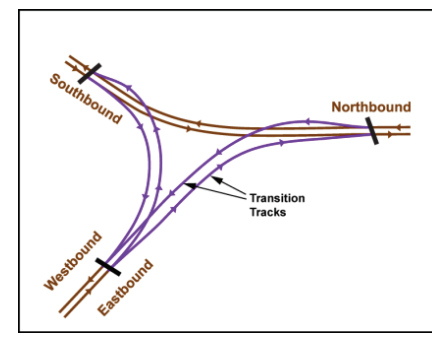


Figure S-3
Overview of SR 152
Wye

major transit hubs. The presence of the stations would also attract office development to the downtowns because of the improved access to the larger markets of Los Angeles and the Bay Area, and the stations could become 24-hour destinations as more commercial businesses are attracted to the area. In addition, residential growth would be expected because of increases in retail, nightlife, and improved multimodal connectivity, rather than residents wanting to commute to Los Angeles or the Bay Area (Authority and FRA 2008).

The cities of Merced and Fresno are updating their general plans to reflect the addition of an HST station in their downtown areas. Both downtowns are poised to become strong activity centers with the addition of the HST. The projected growth for this region is nearly an additional 1 million persons by 2035, with comparable growth in employment even before adding the HST to the Central Valley. The project is estimated to bring 2,600 and 8,400 daily passengers to Merced and Fresno, respectively, and, when combined with the projected growth for the valley, would result in an abundance of people in the downtown areas. The HST would be a catalyst which would concentrate the investment created by population growth at the urban centers that provide interregional connectivity with other metropolitan centers. The HST stations would be compatible with local zoning for higher density development and would build upon existing activity centers. The station areas and the surrounding regions would realize beneficial effects, including increased employment, recreation, and community cohesion. No incompatible changes in land use patterns or intensities are anticipated in downtown urbanized areas.

S.5.4 Heavy Maintenance Facility

The Merced to Fresno Section may include an HMF centrally located on the main north-south line of the HST System to support delivery, testing, and commissioning on the HST System's first completed section. The HMF concept plan indicates that the site should encompass approximately 150 acres to accommodate guideways, maintenance shops, parking, administrative offices, roadways, a power substation, and storage areas.

The HMF would perform the following functions:

- Trainset assembly
- Testing and commissioning
- Train storage
- Inspection
- Maintenance
- Retrofitting
- Overhaul

This Project EIR/EIS evaluates five HMF site alternatives

- Castle Commerce Center – Located in Atwater at the Castle Commerce Center (previously Castle Air Force Base) north of the Downtown Merced Station.
- Harris-DeJager – Located north of the Chowchilla city limits with access from SR 99.
- Fagundes – Located west of the Chowchilla city limits with access from SR 152.
- Gordon-Shaw – Located north of the Madera city limits with access from SR 99.
- Kojima Development – Located south of Le Grand and north of Madera Acres with access from Santa Fe Avenue.

HST Heavy Maintenance Facility

The California HST HMF will support the assembly, testing, commissioning, and acceptance of high-speed rolling stock prior to the start-up of operations. After initial operations begin, the HMF will assume maintenance and major repair functions to sustain the regular operation of the system and activation of new rolling stock as it is delivered.

On October 27, 2011, via email, the Harris-DeJager sponsor withdrew its proposal from the Authority's consideration of potential HMF sites (Kopshever 2011). However, to remain consistent with previous analysis and provide a basis of comparison among the HMFs, the analysis of this potential HMF site continues to be evaluated in the Merced to Fresno Section Final EIR/EIS.

All five HMF sites will be carried forward for additional study, consideration, and decision making as part of the San Jose to Merced Section and Fresno to Bakersfield Section Project EIR/EIS processes.

S.6 Measures to Avoid and Minimize Impacts

The HST Project includes alternatives and design features to avoid and minimize impacts. Project design incorporates the following measures:

- Follows existing transportation corridors to the extent feasible
- Uses shared right-of-way when feasible
- Uses narrowed footprint with elevated or retained cut profile
- Avoids sensitive environmental resources to the extent practical
- Includes passages for wildlife movement
- Spans water crossings where practical

S.7 No Project Alternative Impacts

Projected growth and conversion of land to urbanized uses associated with the No Project Alternative are anticipated to have a much greater environmental effect than the HST Project in the study area over the 2010 to 2035 planning period.

The U.S. Census Bureau American Community Survey (2010) (Census 2011) reported that Merced, Madera, and Fresno counties recorded an average of 3.4 persons per dwelling unit. The preferred growth scenario for average residential units per acre in Merced, Madera, and Fresno counties is approximately 8, 4.7, and 8 residential units per acre, respectively (Mintier Harnish 2010). It would take approximately 40,200 acres of land to accommodate anticipated housing demand. However, this land consumption estimate does not take into account related commercial, transportation, and supporting infrastructure such as parks, water and wastewater treatment facilities, and medical facilities. With necessary supporting infrastructure, including commercial, office, transportation, parks, and schools, a typical population density for an area similar to the San Joaquin Valley would be 8 to 10 people per acre of land development² (Colorado Department of Transportation [CDOT] 2006). Under this scenario, the total three-county growth projections are for approximately 91,000 acres of land development. Additionally, this development is anticipated to follow current patterns dispersed along the edges of city growth boundaries and into unincorporated areas along highways.

An increase in population and employment results in an increasing need to travel between destinations. Even with approved state plans to improve and widen SR 99, Caltrans anticipates that urban areas along SR 99 will not meet acceptable operating standards in 2035. The regional measure for growth in travel is the amount of vehicle miles traveled (VMT) during a given year. Between 2010 and 2035, VMT is projected to increase 80%, 90%, and 20% in Merced, Madera, and Fresno counties, respectively. According to a statewide transportation projection conducted by Cambridge Systematics (2007), the annual VMT for the three-county region is projected to increase from 35 million to almost 50 million by 2035. This increase would require the use of an estimated 1 billion gallons of petroleum in the Merced to Fresno region alone (Bureau of Transportation Statistics 2010).³

Vehicle Miles Traveled (VMT)

A transportation planning term that measures the extent of motor vehicle operation. Specifically, it measures the total number of miles traveled by a vehicle in a specific area over a given period of time.

The conversion of vacant and agricultural land for development will affect and change the character of many of the environmental resources in the study area. Increasingly stringent federal and state emission control requirements and the replacement of older, higher-polluting vehicles with newer, less-polluting

² In Denver, the Colorado Department of Transportation studied land use density as part of the preparation for the US 36 Project Alternative Analysis/EIS (2006). The study included a geographic information system (GIS) analysis of 50 years of land use trends based on historic aerial photos digitized, followed by measurement of actual census data to determine that the gross use of an acre of land supported an average of 10 persons.

³ Based on the 2007 national average fuel economy for passenger and other two-axle, four-tire vehicles.

ones would reduce basin-wide air pollution emissions under the No Project Alternative and air quality would improve. Noise would stay at a similar level because local general plans and noise and vibration ordinances are in place to ensure that standards are met.

Future conditions from increased development would likely result in additional use of electricity and radio frequency communications that would increase the generation of electromagnetic fields (EMFs) and electromagnetic interference (EMI) in the area. Demand for energy would also increase at a level commensurate with population growth under the No Project Alternative, which would require additional generation and transmission capacity. Daily VMT in Merced, Madera, and Fresno counties would increase, requiring additional demand for petroleum.

Existing trends affecting biological resources are expected to continue or worsen, including habitat loss from development, mortality from vehicle strikes, habitat degradation from pollution (e.g., polluted runoff from stormwater, inadvertent spills of hazardous materials), and noise and dust from development. Effects of the current built environment on hydrology and water resources would continue, including effects from continued operation of existing highways, airports, and railways.

A consequence of the No Project Alternative would be that the project vicinity would not include the higher-density, transit-oriented development (TOD) planned around proposed HST stations, and the continuation of low-density development might be more likely. This development pattern would increase impervious ground area and an associated increase in stormwater runoff in the urban fringe. Additionally, increases in traffic would degrade water quality because of increased pollutants in stormwater from vehicles on roadways. Infrastructure and development projects could cause water or wind erosion, loss of valuable topsoil, and constraints on the potential for oil and gas resource development.

Transit-Oriented Development

A transit-oriented development (TOD) is a pattern of dense, diverse, pedestrian-friendly land uses located near transit nodes that, under the right conditions, translates into higher transit patronage (Transit Cooperative Research Program 2004).

Current trends for accidental spills or releases of hazardous materials and wastes would continue with operation of commercial and industrial facilities or during transport of these goods, which would create new contaminated sites. Under the No Project Alternative, safety and security in the study area would follow current trends. Increased vehicular traffic volumes over the next 25 years would be expected to result in increased traffic accidents; however, with planned roadway improvements, it is expected that existing accident trends in the study area would continue into the future. Counties and cities have the financial mechanisms in place to meet service level goals for emergency responders with the population growth planned for the study area. For these reasons, no adverse or significant impact on accident prevention or emergency response is anticipated.

The No Project Alternative would not have the community benefits associated with the HST Project: reduction of traffic congestion on highways and major roadways and improved mobility and access to jobs, educational opportunities, and recreational resources. To the extent the net increase in housing units and industrial space in the region occurs in incorporated cities, it would be consistent with adopted general plans and policies, which aim to strengthen socioeconomic conditions in existing communities and improve neighborhood amenities, potentially benefiting community cohesion. Emergency response times and access would likely be enhanced from transportation improvements but challenged by dispersed development. The planned projects comprising the No Project Alternative would require acquisition of land and may result in displacement of residences and/or businesses, resulting in some economic benefits as well as potential fiscal and employment losses as a result of relocations. Planned transportation improvements would be made to rail, highway, airport, and transit systems, and commercial and residential development projects would occur throughout the region, which as a whole has substantial numbers of communities of concern. As a result, these planned projects may disproportionately affect minority and/or low-income populations.

As described above, the No Project Alternative would result in 91,000 acres of land for future housing and necessary supporting infrastructure. While some infill development could occur without the HST to

act as a catalyst, little TOD is likely to be attracted to the downtown areas of Merced and Fresno with the No Project Alternative. As an example, newly planned residential development proposed in the three counties would primarily be located on currently undeveloped land. Isolated development and roadway transportation projects would not provide the same opportunities for redevelopment within the downtown areas of Merced and Fresno as would the development of HST stations. Overall, the No Project Alternative would not be as strong a catalyst in supporting the development envisioned in these general plans and other planning documents as would the HST alternatives.

Growth would occur on agricultural lands under the No Project Alternative. The eight San Joaquin Valley counties that participated in the San Joaquin Valley Blueprint planning process developed a forecast of farmland conversion to nonagricultural uses by 2050 based on current development patterns. Given continuation of these patterns, 327,000 acres of farmland would be converted by 2050 (San Joaquin Valley Blueprint 2009). Because of the extent and quality of farmland in these counties, most of this growth is likely to occur on Important Farmlands, which includes Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance, as described in the Farmland Mapping and Monitoring Program. Most development in the southern San Joaquin Valley that is currently being planned or permitted is located in the vicinity of urban centers and/or along SR 99. Most of this development would take place on currently unincorporated county land that is largely classified as Prime Farmland, which is land with the best combination of physical and chemical features to sustain long-term agricultural crop production.

The No Project Alternative would not cause or accelerate substantial physical deterioration of parks. Continuing the pattern of converting farmland to development, the No Project Alternative would increase the loss of rural views while resulting in limited improvement to the visual quality in proposed redevelopment areas.

Under the No Project Alternative, cultural resources will continue to be affected in the Central Valley urban areas through the development of land because of growth. Changes in land use and ground disturbance associated with other transportation infrastructure improvements will occur with the expansion of existing highways to accommodate the state's growing population. Adverse effects on eligible resources could result in the neglect, abandonment, or removal of historic properties.

Merced and Fresno land use plans encourage infill and higher-density development in urban areas and concentration of uses around transit corridors to provide more modal choices for residents and workers. Many of the land use scenarios in local plans include HST as a critical element in meeting land use goals, and the No Project Alternative would not support these plans. Under the No Project Alternative, cities would have a more difficult time reducing low-density sprawl and encouraging higher-density development, and fewer modal choices would be available.

Construction of planned development and transportation projects, including the expansion of SR 99, would generate short-term construction employment in the region and a small number of long-term permanent jobs to maintain new and expanded facilities. Under the No Project Alternative, fewer business and employment opportunities would exist in comparison to the HST alternatives. Employment growth would continue to follow existing patterns and would attract fewer of the higher-wage jobs in the financial, insurance, and real estate sectors than would occur under the HST alternatives.

S.8 HST Alternatives Evaluation

Table S-1 provides a high-level comparison of key design features associated with each of the three HST alternatives carried forward. This section then presents discussions of the impacts that differentiate the alternatives (and proposed mitigation measures) and the HMF alternatives (and proposed mitigation measures), as well as cost estimates for each alternative. This section provides an overview of effects potentially resulting from implementing project alternatives, including (1) benefits common to all HST alternatives and resources that do not require mitigation measures (see Section S.8.1), (2) impacts common to all project alternatives and their mitigation measures (see Section S.8.2), and (3) comparison of project alternative impacts and their mitigation measures (see Section S.8.3). Section S.8.4 provides a

cost comparison of the alternatives. Following these descriptions are tables that show a comparison among the alternatives. Table S-4 is a quantitative comparison of significant impacts that are different among alignment alternatives, showing impacts associated with the north-south portion of the alignments (and their design options) separately from the impacts associated with the wye options. Table S-5 summarizes all significant impacts for the alignment alternatives (UPRR/SR 99, Hybrid, and BNSF), along with mitigation measures proposed to reduce the impacts. Table S-6 lists impacts that differ among the five HMF alternatives, along with mitigation measures proposed to reduce the impacts.

Table S-1
Design Features of Alternatives Carried Forward

Alternative:	UPRR/SR 99 Alternative			Hybrid Alternative		BNSF Alternative							
Design Features:	East Chow- chilla		West Chow- chilla			Mariposa Way				Mission Ave			
						Le Grand Design Option		East of Le Grand Design Option		Le Grand Design Option		East of Le Grand Design Option	
Wye:	Ave 24	Ave 21	Ave 24	Ave 24	Ave 21	Ave 24	Ave 21	Ave 24	Ave 21	Ave 24	Ave 21	Ave 24	Ave 21
Total length ^a (linear miles)	90	86	74	75	76	94	92	95	93	94	92	95	93
At-grade profile ^a (linear miles)	49	49	43	58	57	69	69	69	69	69	69	69	69
Elevated profile ^a (linear miles) (including retained fill)	41	37	32	17	19	25	23	26	24	25	23	26	24
Number of Straddle Bents ^b	60	78	75	55	40	52	43	52	43	52	43	52	43
Number of Railroad Crossings	9	9	7	6	4	6	6	10	10	6	6	10	10
Number of Water Crossings	98	105	113	113	113	92	97	88	93	104	109	101	106
Approximate Number of Roadway Closures ^c	23	26	32	49	37	74	59	80	65	71	56	77	62
Number of Roadway Overcrossings	29	26	29	47	43	51	43	51	43	51	43	51	43

^a Lengths shown are based on equivalent dual-track alignments. For example, the length of single-track elevated structure will be divided by a factor of 2 to convert to dual-track equivalents.

^b The number of straddle bents was estimated by dividing the preliminary structural span lengths by 100 feet, the assumed spacing between columns/bents. Actual structural configuration to be determined during design.

^c Includes public and private road closures.

S.8.1 HST Benefits

Of the 2,600 daily riders who would board the HST at the Downtown Merced Station in 2035, approximately 84% would have otherwise taken an automobile trip to their destination. Overall, the HST Project would reduce daily VMT by 7.7% in Merced County, 2.7% in Madera County, and 7.9% in Fresno County⁴, resulting in the benefits of decreased fuel consumption, decreased congestion, improved travel time, and reductions in air pollution emissions. The HST also would reduce the demand and substitute for commercial air travel within California.

Although the HST Project would increase electricity consumption compared to the No Project Alternative, the HST Project would reduce vehicle and air travel miles with corresponding reductions in fuel consumption and air emissions, for a substantial net reduction in emissions. In addition, the State of California requires that an increasing fraction (33% by 2020) of the electricity generated for the state's power portfolio come from renewable energy sources. As such, the emissions generated for powering the HST System are expected to be lower in the future than the emission estimates included in this Project EIR/EIS. The Authority has also adopted a policy goal to use up to 100% renewable energy sources for the HST System, which would result in a greater overall reduction in emissions from the HST Project.

The HST stations would have the benefit of encouraging high-density transit-oriented development in Merced and Fresno and would attract development away from the edges of urban boundaries (also called sprawl). The HST Project could improve water quality compared to the No Project Alternative because of decreased VMT and the encouragement of transit-oriented development, which in turn would reduce non-point source pollutants through trip reduction and increased density. The HST Project could induce slight population and employment growth throughout the region, including in the communities that would not have an HST station. Indirect impacts would increase employment opportunities and economic vitality throughout the region, a result not likely under the No Project Alternative. Under current city and county general plans in the region, communities in the region have adopted urban growth boundaries to accommodate growth beyond planned growth by 2035, including any growth induced by the HST Project. HST-induced growth would, therefore, not require farmland conversion beyond what is currently planned. Generally, low-income and minority populations reside throughout the Merced-to-Fresno corridor; therefore, benefits such as improved mobility, air quality, and employment would accrue to these low-income and minority populations because they represent such a large percentage in the region.

Analysis of the HST alternatives has determined that by applying required federal and state regulations and engineering standards, the construction and operation of the project would have impacts of negligible intensity on electromagnetic interference/electromagnetic fields (EMI/EMF); hydrology and water resources; geology, soils, and seismicity; station planning, land use, and development; and regional growth.

S.8.2 Adverse Effects Common to All HST Alternatives

The following potentially significant impacts would occur with all HST alternatives. The impact analysis takes into account design features and the implementation of regulatory requirements, both of which would reduce impacts from implementing the project prior to application of mitigation measures.

Tables S-4 and S-5 show the detailed differences among the alternatives, along with the associated mitigation measures for these impacts. Section S.8.3, Comparison of Alternatives, describes these differences.

- **Transportation:** All alternatives would result in intersection and roadway impacts in the Fresno area between Herndon Avenue and Shaw Avenue, which would be mitigated to negligible intensity under NEPA and less than significant under CEQA by modifying signal phasing and timing, adding signals in some locations, widening approaches to some intersections, and adding lanes or grade separating in some locations. The project would require relocation of SR 99 and would result in station area

⁴ Based on implementation of Phase 1 of the project.

intersection impacts during operation. Mitigation measures for these impacts would reduce them to negligible intensity under NEPA and less than significant under CEQA, including the addition of a southbound auxiliary lane to SR 99, roadway widening, additional turn lanes, restriping, and traffic signal improvements. Additionally, all HST alternatives would result in potential interference between elevated guideways and future highway overcrossings and permanent road closures, which would be mitigated to negligible intensity under NEPA and less than significant under CEQA by maintaining access for property owners.

- Air Quality:** Emissions of volatile organic compounds (VOC) and nitrous oxides (NO_x) during construction would be greater than applicable significance thresholds during some of the construction years, which would exceed the General Conformity applicability thresholds for these pollutants and may impede compliance with the 8-hour San Joaquin Valley Air Pollution Control District's (SJVAPCD) 2007 Ozone Plan (SJVAPCD 2007) and the 2004 Extreme Ozone 1-hour Plan (SJVAPCD 2004). Mitigation of construction-period impacts would include standard best management practices (BMPs) during construction; reducing criteria exhaust emissions from on-road and off-road construction equipment and offsetting project construction emissions through a SJVAPCD Voluntary Emission Reduction Agreement (VERA). After mitigation, air quality construction-period impacts would be reduced to negligible intensity under NEPA and would be less than significant under CEQA. Hauling materials needed for track construction could also exceed applicable CEQA and/or NEPA NO_x thresholds in some air basins outside of the San Joaquin Valley Air Basin (SJVAB). This would be mitigated by using vehicles with lower emissions and purchasing emission offsets if necessary. Air quality impact after mitigation would be of negligible intensity under NEPA and less than significant under CEQA for all pollutants in all air districts and air basins.

Air Quality Sensitive Receptors

Sensitive receptors are people who have an increased sensitivity to air pollution or environmental contaminants. Sensitive receptor locations include schools, parks and playgrounds, day care centers, nursing homes, hospitals, and residences.

Project operations for all HST alternatives would result in a net benefit to air quality because the HST Project would result in lower mobile source air toxics (MSATs), greenhouse gases (GHG), VOC, NO_x, CO, PM₁₀, and PM_{2.5} emissions compared to the No Project Alternative.

- Noise and Vibration:** All HST alternatives would create noise and vibration impacts during construction. Mitigation of construction noise impacts would include noise monitoring during construction and requiring the contractor to implement one or more noise control measures to meet noise limits. Building damage from construction vibration is anticipated only from impact pile driving very closely to buildings. Damage from construction vibration is not anticipated if piling takes place more than 25 to 50 feet from buildings, or if alternative methods such as push piling or auger piling can be used. Mitigation would include preconstruction surveys to document the existing condition of buildings located within 50 feet of piling. After mitigation, construction noise and vibration impacts would be of negligible intensity under NEPA and less than significant under CEQA.

All HST alternatives would create noise and vibration impacts during operation. Mitigation for operational noise and vibration includes installation of sound barriers, implementation of noise and vibration mitigation guidelines, vehicle noise specification, special trackwork at crossovers and turnouts, and additional noise analysis during final design. In some locations, operational noise impacts of substantial intensity under NEPA and significant under CEQA would occur, but when fully mitigated they would be of negligible intensity under NEPA and less than significant under CEQA. Operational vibration impacts could remain substantial under NEPA and significant under CEQA if mitigation is not feasible.

- Public Utilities and Energy:** Road improvements associated with the BNSF and Hybrid alternatives would conflict with an electrical substation, while the Ave 21 Wye (a component of the UPRR/SR 99, BNSF, and Hybrid alternatives) would directly conflict with a second electrical substation. These impacts would be of substantial intensity under NEPA and significant under CEQA. Mitigation would occur through design refinement of the project features along the BNSF and Hybrid alternatives



alignments to minimize impacts on the substation, and relocation of the substation within the footprint of the Ave 21 Wye. The impacts would be reduced to negligible intensity under NEPA and would be less than significant under CEQA.

- **Biological Resources:** The construction of the Merced to Fresno Section would permanently remove the vegetative cover from within the construction footprint along with any associated potential habitat for special-status species. Operation of the project would also permanently impact jurisdictional waters and critical habitat. The Merced to Fresno Section would traverse the Camp Pashayan Ecological Reserve. Mitigation for impacts during construction include preparing and implementing a weed control plan; a mitigation and monitoring plan; delineating and compensating for permanent impacts on jurisdictional waters, as well as special-status plant and animal populations; and installing noise barriers. Construction impacts would be reduced to negligible intensity under NEPA and less than significant under CEQA through the implementation of all mitigation measures and regulatory requirements.

The operation of the Merced to Fresno Section would potentially spread noxious weed species and would bisect existing habitat that has the potential to support special-status plant and animal species. Operation of the HST would indirectly affect jurisdictional waters, the Great Valley Conservation Bank, and the Camp Pashayan Ecological Reserve. All alternatives affect Camp Pashayan, which is protected as an ecological preserve under Title 14 of the California Code of Regulations. The Authority would prepare and issue a Resolution of Necessity and submit it to the Public Works Board as part of the right-of-way process. Mitigation of operation-period impacts include weed prevention and control, environmental training, delineating environmentally sensitive locations, implementing a biological resources management plan, and implementing special-status species protection measures, restoring temporarily affected areas. Operation-period impacts would be reduced to negligible intensity under NEPA and less than significant under CEQA after the implementation of these mitigation measures and compliance with regulatory requirements.

- **Hazardous Materials and Waste:** Construction of all HST alternatives could result in accidents or spills related to hazardous materials and waste and could affect sites of potential environmental concern, which would result in temporary hazards to schools. During project construction, handling of extremely hazardous materials within 0.25 mile of a school would be avoided by requiring that contractors not use extremely hazardous substances or a mixture thereof in a quantity equal to or greater than the state threshold quantity (Health and Safety Code Section 25532) within 0.25 mile of a school. With implementation of mitigation, this impact would be reduced to negligible intensity under NEPA and would be less than significant under CEQA.
- **Safety and Security:** All HST and HMF alternatives could increase demand for local emergency responders around the stations and HMF due to station activity and associated redevelopment and economic activity. This could increase response times and require new or physically altered government facilities that might impact the environment. This is a potentially moderate intensity impact under NEPA and a significant impact under CEQA. As mitigation, emergency response to station and HMF incidents would be monitored, and if it is determined that the HST Project does result in increased demand, a fair share impact fee to local service providers would be negotiated, reducing effects to negligible intensity under NEPA and less than significant under CEQA.
- **Socioeconomics, Communities, and Environmental Justice:** All of the HST alternatives would result in the displacement of a homeless shelter in the City of Merced. This impact would be mitigated by replacing community facilities and continuing outreach to disproportionately and negatively affected environmental justice communities of concern. A construction plan would be developed and implemented to address communications, community impacts, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on low-income households and minority populations and to maintain access to local businesses, residences, and emergency services. With implementation of mitigation, this impact would be reduced to negligible intensity under NEPA and less than significant under CEQA.

- Agricultural Lands:** Construction and operation of all alternatives and the HMF would result in permanent conversion of agricultural land to nonagricultural use. Mitigation of this impact includes preservation of Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Unique Farmland and creation of a farmland consolidation program to sell non-economic remnant parcels to neighboring landowners. With mitigation, this impact would remain of substantial intensity under NEPA and significant under CEQA. This mitigation measure would be effective given the nationwide and local success of farmland preservation programs using agricultural conservation easements and the experience of the Department of Conservation's California Farmland Conservancy program; however, mitigation would not replace lost agricultural land.
- Parks, Recreation, and Open Space:** All HST alternatives would have construction and operations impacts on Camp Pashayan in Fresno. Construction-period impacts would be mitigated to negligible intensity under NEPA and less than significant under CEQA by compensating for staging in park property during construction. Project operation would result in partial acquisition of Camp Pashayan, which is an impact with substantial intensity under NEPA and a significant impact under CEQA. Impacts would be mitigated to negligible intensity under NEPA and less than significant under CEQA through the acquisition process. The UPRR/SR 99 Alternative would have construction-period impacts on three additional parks that would be of substantial intensity under NEPA; impacts on two of these parks would also be considered significant under CEQA. The UPRR/SR 99 Alternative would also permanently acquire property from two other parks, which would be considered an impact of substantial intensity under NEPA and a significant impact under CEQA. At Roeding Park, all three HST alternatives would have operation noise impacts of severe intensity on the eastern portions of the park without noise mitigation; the impact would be of substantial intensity under NEPA and significant under CEQA. The noise impact at Roeding Park can be mitigated to less than significant. The Authority will work with the City of Fresno as the park owner to address noise impacts.
- Visual and Aesthetic Resources:** All HST alternatives would cause temporary visual disturbance during construction, including new sources of light and glare, and would be considered visual nuisances in some urban areas adjacent to residential and historical resources. All HST alternatives would permanently lower visual quality west of SR 99. All alternatives would use retained fill for overcrossings and sound barriers along the guideway in urban areas. These project components, along with traction power substations (TPSS) and HMFs, would block views of areas behind them to varying degrees. Mitigation measures to reduce impacts include minimizing visual disruption from construction; incorporating design criteria for elevated guideway, structures, and station elements that consider local context; and replanting unused portions of acquired land. Mitigation for overcrossings, sound barriers, and retained fill elements include landscaping to screen and blend them into the surrounding environment, as well as surface treatments that will consider local context and discourage graffiti. These mitigation measures will also be used for TPSSs and the HMF. The Authority will work with local jurisdictions to develop appropriate visual/aesthetic mitigation measures. These mitigation measures will need to be of reasonable cost and meet engineering design parameters. Appropriate mitigation measures will vary by location but will be compatible with the context of areas adjacent to HST elements. For all HST alternatives, HST station design and associated new landscape architectural elements would improve visual quality in areas near the HST stations in Merced and Fresno. With mitigation, visual disruption from construction and TPSS impacts would be reduced to negligible intensity under NEPA and less than significant under CEQA for all HST alternatives. With mitigation, and depending on height, location, and materials, sound barriers and retained fill would have impacts of substantial intensity under NEPA and significant under CEQA.
- Cultural and Paleontological Resources:** All HST alternatives have the potential to affect archaeological, paleontological, and built environment historic resources during construction. All HST alternatives have the potential to affect built environment resources during operation. Archaeological and paleontological resources will not be affected by HST operations.

Mitigation for construction impacts on archaeological resources will include conducting archaeological training, halting work in the event of an archaeological discovery, planning an intentional site burial for preservation in-place, and conducting data recovery investigations. After mitigation, the impacts

on archaeological resources are anticipated to be of negligible intensity under NEPA and less than significant under CEQA.

Mitigation for construction impacts on paleontological resources will include engaging a paleontological resources specialist to direct monitoring during construction, implementing a paleontological resources monitoring and mitigation plan, and halting construction if paleontological resources are found. After mitigation, impacts on paleontological resources are expected to be of negligible intensity under NEPA and less than significant under CEQA.

Mitigation for impacts on built environment resources will include vibration avoidance measures; protection and stabilization measures; relocation of historic structures; noise attenuation measures; preparation and submission of National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) nominations; preparation of a Historic American Building Survey (HABS), Historic American Engineering Record (HAER), and Historic American Landscape Survey (HALS); preparation of Historic Structure Reports (HSRs); preparation of interpretive exhibits; and repair of inadvertent damage. After mitigation, construction noise and vibration impacts would remain of substantial intensity under NEPA and significant under CEQA. During construction, all HST alternatives have the potential to affect resources listed in or eligible for the NRHP (Section 106). After mitigation, construction impacts would remain adverse under Section 106, of substantial intensity under NEPA, and significant under CEQA. During operation, all HST alternatives have the potential to affect one resource, Roeding Park in Fresno, which is eligible for listing in the NRHP (Section 106). After mitigation, operational noise impacts would remain adverse under Section 106, of moderate intensity under NEPA, and could be mitigated (see Parks, Recreation, and Open Space above) to less than significant under CEQA.

S.8.3 Comparison of HST Alternatives

Tables S-4 and S-5 compare each of the three alignment alternatives. Subsections S.8.3.1 through S.8.3.3 below summarize the main differences among the alternatives. Section S.8.3.4 discusses stations, and Table S-6 and Section S.8.3.5 summarize the main differences among the HMF alternatives. Many regulations require implementing measures that reduce impacts. The Authority will comply with these regulations and, therefore, these measures are not listed here. In addition, the Authority will strive to avoid and minimize impacts as design progresses. The following comparisons of the Avenue 22 and Avenue 21 wyes with the SR 152 wye is based on conceptual engineering developed for the *Supplemental Alternatives Analysis for the San Jose to Merced Section*. Additional alignment refinements are anticipated for the SR 152 wye.

Comparison tables are located at the end of this Summary.

S.8.3.1 UPRR/SR 99 Alternative

The UPRR/SR 99 Alternative would have more guideway adjacent to existing transportation corridors than the other alternatives (BNSF and Hybrid alternatives) and would provide the shortest potential guideway length (West Chowchilla design option) and fastest travel (Ave 21 Wye) as part of the Phase 1 San Francisco to Los Angeles travel time requirements. Unless the West Chowchilla design option is approved, the UPRR/SR 99 Alternative would extend through Chowchilla and Madera, where stations are not proposed. Because it would pass through these communities, the UPRR/SR 99 Alternative would generally result in greater community impacts (impacts related to noise, air quality, parks, and historic properties) than the other alternatives. As shown in Figure S-4, this alternative would require several crossings of UPRR and SR 99, some of which would require modification of SR 99 interchanges.

Generally, the UPRR/SR 99 Alternative would have more elevated structures crossing the UPRR and SR 99 than the other alternatives. Because this alignment closely parallels UPRR and SR 99, a series of straddle bents would support several difficult and lengthy UPRR and SR 99 crossings. The UPRR/SR 99 Alternative would be the most expensive to build as a result. The West Chowchilla design option would reduce the length of elevated structures compared to the other option within the UPRR/SR 99 Alternative.

The West Chowchilla design option would also reduce the cost of the UPRR/SR 99 Alternative because of the substantially shorter length of at-grade guideway and elevated guideway. The UPRR/SR 99 Alternative could result in fewer acquisitions than the BNSF Alternative and more acquisitions than the Hybrid Alternative. Depending on the wye connection, the HST Project would acquire 1,125 to 1,186 properties to construct the UPRR/SR 99 Alternative, resulting in 193 to 228 residential displacements and 284 to 295 business displacements. The UPRR/SR 99 Alternative would also have fewer road closures than the BNSF Alternative or the Hybrid Alternative because of its extensive elevation adjacent to UPRR and SR 99.

Construction of the UPRR/SR 99 Alternative would have the most severe air quality impacts because of the number of roadway interchanges that would be reconstructed and the greater amount of elevated guideway. This would require more construction equipment which would result in higher emissions. More severe operational noise impacts on residences and institutions would occur under this alternative than under the BNSF or Hybrid alternatives. The UPRR/SR 99 Alternative would have an effect of moderate to substantial intensity on plant communities and land cover types, special-status plant communities, as well as waters under the jurisdiction of the USACE and the California Department of Fish and Game (CDFG) (e.g., wetlands, lakes, streams.) The UPRR/SR 99 would have an effect of moderate intensity on, special status plant and wildlife species.

This alternative would affect the fewest acres of Important Farmland and Williamson Act land but would affect more acres of Farmland Security Zone land than the BNSF Alternative and potentially more than the Hybrid Alternative, depending on the selected wye. Park impacts would be greater for the UPRR/SR 99 Alternative than for the BNSF and Hybrid alternatives, including closure or use of four to five (depending on timing of construction of a planned trail) parks during construction and partial acquisition of three parks. The UPRR/SR 99 Alternative would affect the greatest number of archaeological resources.

The wye connections to the UPRR/SR 99 Alternative differ in level of impacts. Some of the differences include impacts on riparian habitat, water bodies crossed, agricultural lands, and communities. The Ave 24 Wye connection would affect more riparian habitat than the Ave 21 Wye connection. The Ave 21 Wye connection would impact more important farmlands and Williamson Act lands than the Ave 24 Wye connection. Either wye connection with the East Chowchilla Design Option would pass through the east portion of Chowchilla, while the Ave 24 Wye connection with the West Chowchilla design option would avoid Chowchilla.

The SR 152 Wye connection to the UPRR/SR 99 Alternative is not evaluated in this Project EIR/EIS, but preliminary impacts evaluation indicates that this wye connection may avoid the impacts to the community of Fairmead that would occur under the Ave 24 and Ave 21 Wye connection and would result in more impacts on agricultural lands than the Ave 24 and Ave 21 Wye connections. The SR 152 Wye would pass along the east side of Chowchilla, somewhat similarly to the other wye connections with the

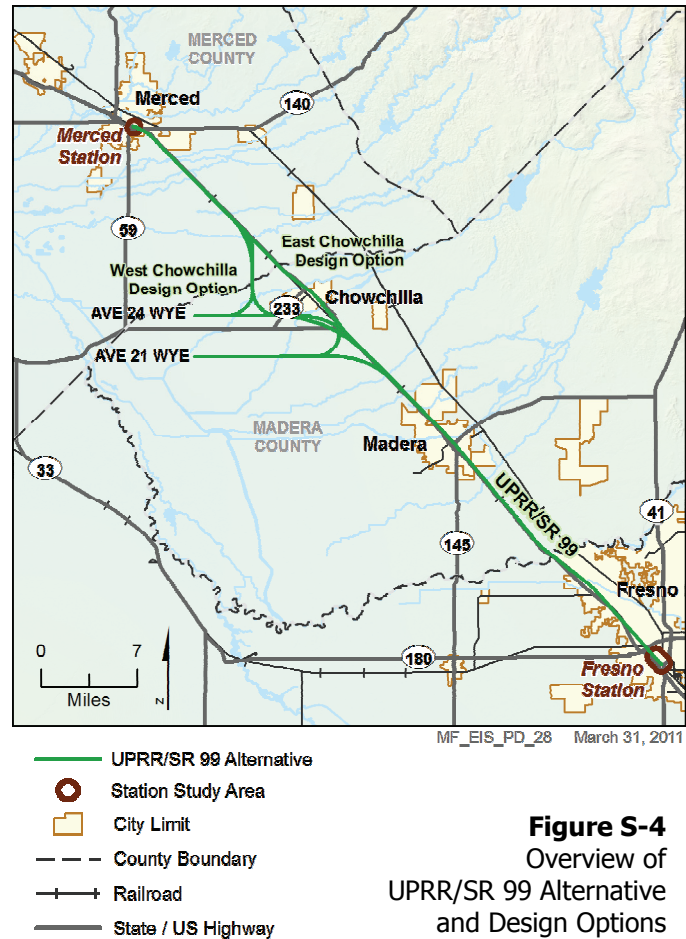


Figure S-4
Overview of
UPRR/SR 99 Alternative
and Design Options

East Chowchilla design option, while the Ave 24 Wye with the West Chowchilla design option would avoid Chowchilla.

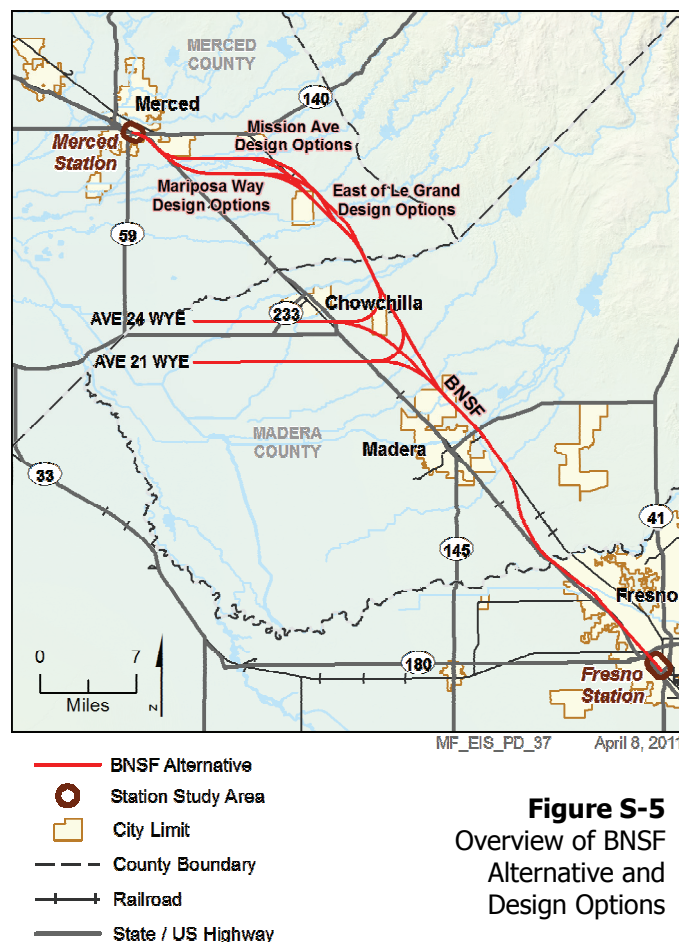
S.8.3.2 BNSF Alternative

The BNSF Alternative would be adjacent to existing transportation corridors (BNSF railroad tracks) for a portion of its alignment; however, as shown in Figure S-5, it would deviate from the BNSF railway between Merced and Le Grand and then again south of Madera Acres to rejoin the UPRR/SR 99 Alternative. Generally following the BNSF railway from Merced to Madera, where the alternative diverges from the UPRR/SR 99 Alternative, this alternative would travel in an alignment ranging from 2 to 5 miles west of SR 99. This would be approximately 2 to 9 miles longer than the UPRR/SR 99 Alternative (with the East Chowchilla design option, depending on the wye connection associated with each alternative), and result in a longer travel time. In addition, the HST alternatives would require much larger radius curves than the existing BNSF railway. As a result, near BNSF railway curves, the HST guideway would veer away from the BNSF tracks to allow for larger curvatures before rejoining the BNSF corridor. The BNSF Alternative would pass through rural areas and, therefore, would require fewer modifications to major roads, interchanges, or city businesses and industries in Chowchilla and Madera than the UPRR/SR 99 Alternative.

The BNSF Alternative would be mostly at-grade, with 21 to 24 miles of elevated structures. The BNSF Alternative also would have several railroad crossings, particularly when associated with East of Le Grand design options. The BNSF Alternative would pass through rural areas where local roads cross the BNSF railroad at-grade. As a result, depending on the design option and wye selected, the BNSF Alternative would result in more road closures than the other alternatives, but new grade-separated overcrossings would be provided at least every 2 miles after mitigation. The BNSF Alternative would potentially result in the greatest number of property acquisitions of the three HST alternatives. Depending on the wye connection, the HST Project would acquire 1,149 to 1,283 properties to construct the BNSF Alternative, resulting in 215 to 244 residential displacements and 217 to 237 business displacements.

The BNSF Alternative could result in vibration impacts on one residence near Le Grand. The BNSF Alternative would have an effect of moderate to substantial intensity on plant communities and land cover types, waters under the jurisdiction of the USACE and the California Department of Fish and Game, and special-status plant communities. The BNSF Alternative would have an effect of moderate intensity for special-status plant and wildlife species. It is the only alternative that would affect the Great Valley Conservation Bank (a mitigation bank), and federally designated critical habitat for vernal pool associated species. The BNSF would also affect more acres of vernal pools and other seasonal wetland than the Hybrid Alternative or the UPRR/SR 99 Alternative. The BNSF Alternative would also cross the Eastman Lake-Bear Creek ECA for a longer distance.

The BNSF Alternative would result in security impacts on a state prison, but with mitigation, these impacts would be less than significant. The BNSF Alternative would potentially affect the most acres of



Important Farmland and Williamson Act Land (depending on the design option) but would affect the fewest acres of Farmland Security Zone land. The BNSF alternative would lower visual quality in the greatest number of landscape units. The BNSF Alternative would result in visual impacts on the community of Le Grand where the elevated guideway would extend along the BNSF through the town. The BNSF Alternative would affect a similar number of archaeological and historical resources as the Hybrid Alternative, and potentially fewer than the UPRR/SR 99 Alternative, depending on the design option. The BNSF Alternative would have the greatest potential to affect paleontological resources during construction.

The wye connections to the BNSF Alternative differ in level of impacts. Some of the differences include impacts on riparian habitat and agricultural lands. The Ave 24 Wye connection would impact more riparian habitat than the Ave 21 Wye connection. The Ave 21 Wye connection would impact more important farmlands and Williamson Act lands than the Ave 24 Wye connection and would result in more diagonal bifurcation of farmlands because of a longer southbound wye leg than would occur with the Ave 24 Wye connection.

The SR 152 Wye connection to the BNSF Alternative is not evaluated in this Project EIR/EIS, but preliminary impacts evaluation indicates that this wye connection would impact the community of Fairmead, which would be avoided under the Ave 24 and Ave 21 Wye connections, and would result in more impacts on agricultural lands than the Ave 24 and Ave 21 Wye connections.

S.8.3.3 Hybrid Alternative

The Hybrid Alternative, like the BNSF Alternative, would be adjacent to existing transportation corridors for a portion of its alignment, but would deviate from these corridors between Chowchilla and Madera Acres and then again south of Madera Acres, as shown in Figure S-6. Because it would follow the legs of the Ave 24 Wye (if that wye option were selected) and would follow the portion of the BNSF corridor closest to the UPRR corridor under both the Ave 24 and Ave 21 wye connections, the Hybrid Alternative would be shorter than all other alternatives except the UPRR/SR 99 Alternative with the West Chowchilla design option. The Hybrid Alternative would avoid impacts on the community of Le Grand, and Downtown Madera.

The Hybrid Alternative, similarly to the BNSF Alternative, would pass through more rural areas than the UPRR/SR 99 Alternative. The Hybrid Alternative would potentially result in the fewest property acquisitions of the HST alternatives. Depending on the wye connection, the Hybrid Alternative would require 1,100 to 1,139 property acquisitions, including 186 to 213 residential displacements and 212 to 226 business displacements. This alternative would result in the fewest residential and business displacements. The Hybrid Alternative would require more local road closures than the UPRR/SR 99 Alternative but, depending on the alternative selected, would have fewer than the BNSF Alternative. New grade-

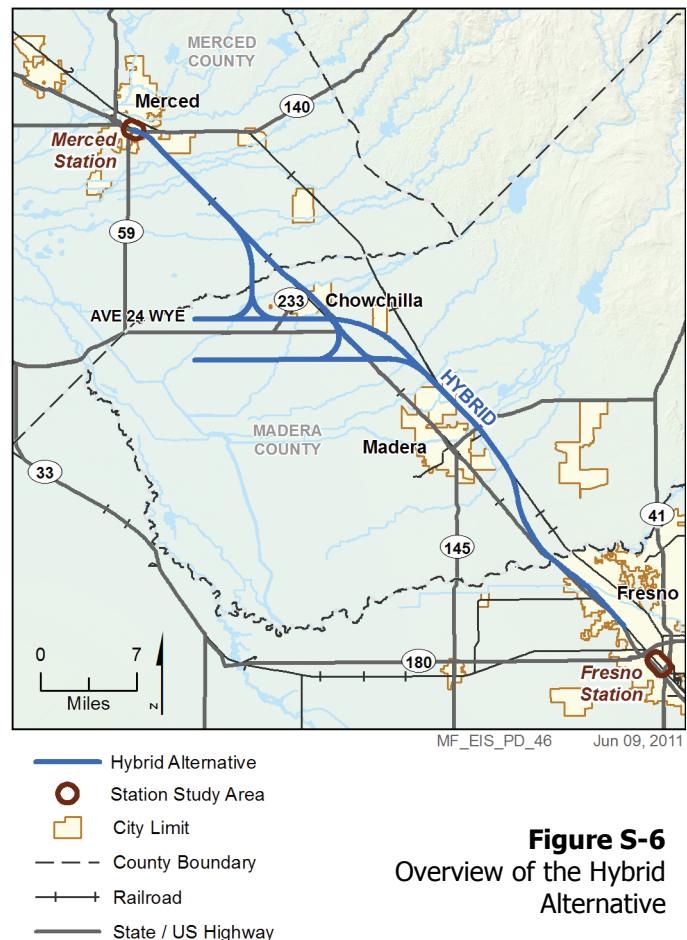


Figure S-6
Overview of the Hybrid Alternative

separated overcrossings would occur at intervals of approximately 2 miles. This alternative would have the least severe air quality impacts during construction because it would have the smallest quantity of elevated structure, which would require less construction equipment and result in lower emissions.

The Hybrid Alternative would have an effect of moderate to substantial intensity on plant communities and land cover, special-status plant communities, and waters under the jurisdiction of USACE and CDFG. The Hybrid Alternative would have an effect of moderate intensity on special-status plant and wildlife species. The extent of the impact would be generally lower than for the BNSF Alternative and either greater than or similar to impacts associated with the UPRR/SR 99 Alternative. The Hybrid Alternative would have the fewest visual impacts of any of the alternatives. The Hybrid Alternative would have the lowest impact on paleontological resources during construction. The Hybrid Alternative would affect the same number of archaeological and historical resources during construction as the BNSF Alternative and fewer than the UPRR/SR 99 Alternative.

The wye connections to the Hybrid Alternative differ in level of impacts. Some of the differences include impacts on riparian habitat, water bodies crossed, agricultural lands, communities, high-risk utilities, and noise impacts. The Ave 24 Wye connection would affect more Important Farmland and riparian habitat, and would cross more water bodies, than the Ave 21 Wye connection. The Ave 21 Wye connection would affect more Williamson Act lands than the Ave 24 Wye connection.

The SR 152 Wye connection to the Hybrid Alternative is not evaluated in this Project EIR/EIS, but preliminary impacts evaluation indicates that this wye connection would impact the community of Fairmead, which would be avoided under the Ave 24 Wye connection, and would result in more impacts on agricultural lands than the Ave 24 and Ave 21 Wye connections would. The SR 152 Wye would pass along the east side of Chowchilla, somewhat similarly to the Ave 21 Wye connection, while the Ave 24 Wye would avoid Chowchilla.

Overall, the Hybrid Alternative would have natural resource impacts generally similar to the UPRR/SR 99 Alternative and fewer impacts than the BNSF Alternative. The Hybrid Alternative would result in fewer effects on community resources than either of the other two alternatives, and substantially less than the UPRR/SR 99 Alternative, particularly construction impacts such as noise, dust, air quality, and reduced access to parks and businesses. The Hybrid Alternative would balance the effects on natural and community resources and would minimize environmental impacts to the greatest degree. This is because the Hybrid Alternative would be shorter than the BNSF Alternative and have less elevated guideway and fewer impacts on adjacent infrastructure than the UPRR/SR 99 Alternative would. It would avoid the greater impacts on the environment and rural communities in Merced County that would occur with the BNSF Alternative, and it would avoid the greater impacts on more-urban areas along the UPRR/SR 99 Alternative, such as in the City of Madera.

S.8.3.4 HST Stations

The stations analyzed in this Project EIR/EIS include one station in the City of Merced and two station alternatives in the City of Fresno. Impacts for the Fresno station alternatives would be similar. Both stations would affect a historic structure eligible or already on the National Register of Historic Places. Other effects include noise that would be mitigated, as well as temporary impacts on businesses and transportation circulation during construction. The City of Fresno's Transportation Master Plan includes relocating the city's transit center across from the Downtown Fresno HST Station and specifies that the Mariposa Street Station Alternative would better serve the planned transit improvements for the downtown area. Because of the City's planning and the orientation of the Downtown Fresno City Center, the Mariposa Street Station Alternative offers substantially more opportunities for transit-oriented development.

S.8.3.5 Heavy Maintenance Facility

Table S-6 compares each of the HMF alternatives based on the potentially significant impacts that differ among the alternatives. Selection of an HMF location will be related to the HST alignment alternative chosen and the potential impacts associated with the location as well as other factors.

All HMF alternatives would contribute to a potential exceedance of PM_{10} and $PM_{2.5}$ thresholds resulting from existing exceedances in the area, which would be mitigated by reducing the potential impact of stationary sources, but which would remain of substantial intensity under NEPA and significant under CEQA.

The Castle Commerce Center HMF site would result in the highest number of affected intersections in comparison to the other HMF options. Operation of this HMF could expose sensitive receptors to substantial toxic air contaminant (TAC) pollutant concentrations. This HMF alternative would result in the division of a mobile home community and would displace three community facilities. The Castle Commerce Center HMF would require the acquisition of the entire Joe Stefani Elementary School property (14.5 acres) for project construction. The Castle Commerce Center HMF would result in the greatest number of residential and business displacements in comparison to the other HMF alternatives. Of all of the alternatives, this HMF site would impact the fewest acres of Important Farmlands. The Castle Commerce Center HMF site would potentially affect two archaeological resources.

The Harris-DeJager HMF site would result in the fewest intersection impacts. This site would permanently affect the Eastman Lake-Bear Creek ECA. Along with the Gordon-Shaw HMF site, this site would impact the most acres of Important Farmland of all of the HMF sites.

The Fagundes HMF site would impact an intermediate number of intersections compared to the other HMF sites. This site would affect fewer acres of Important Farmland than three of the other sites.

The Gordon-Shaw HMF site could expose sensitive receptors to substantial TAC pollutant concentrations during operations. The Gordon-Shaw HMF site, along with the Harris-DeJager site, would impact the most acres of Important Farmland of all the HMF sites.

The Kojima Development HMF site could expose sensitive receptors to substantial TAC pollutant concentrations during operations. This site would permanently affect the Berenda Slough riparian corridor and would affect one potential archaeological resource.

S.8.4 Capital Cost

Table S-2 reflects the highest cost range (in 2010 dollars) estimated for each alternative; each alternative has been estimated separately for each wye design option. The BNSF and Hybrid alternatives would have fewer miles of costly elevated guideway and fewer modifications to the state highway system than the UPRR/SR 99 Alternative because they would avoid urban areas that require grade separation over multiple roadways to minimize impacts. Both alternatives would be less expensive than the UPRR/SR 99 Alternative as a result. Because the BNSF and Hybrid alternatives would require less elevated guideway and fewer modifications to the state highway system than the UPRR/SR 99 Alternative with the West Chowchilla design option, they would cost substantially less.

All the HMF sites would contain the same facilities to provide maintenance services for the HST System. An HMF at the Harris-DeJager, Fagundes, Gordon-Shaw, or Kojima Development sites would cost approximately \$660.8 million for full build out based on conceptual site and functional layouts for the facilities. An HMF at the Castle Commerce Center site would cost approximately \$1.067 billion because it would require an access guideway from the Downtown Merced Station.

Table S-2
Capital Cost of the HST Alternatives (2010 \$Thousands)

FRA Standard Cost Categories	UPRR/SR 99 Alternative with Ave 24 Wye	UPRR/SR 99 Alternative with Ave 21 Wye	UPRR/SR 99 Alternative West Chowchilla Design Option with Ave 24 Wye	BNSF Alternative with Ave 24 Wye	BNSF Alternative with Ave 21 Wye	Hybrid Alternative with Ave 24 Wye	Hybrid Alternative with Ave 21 Wye
10 Track Structures & Track	\$3,485,000	\$3,008,000	\$2,629,000	\$1,961,000	\$1,844,000	\$1,383,000	\$2,059,000
20 Stations, Terminals, Intermodal	\$170,000	\$170,000	\$170,000	\$170,000	\$170,000	\$170,000	\$170,000
30 Support Facilities: Yards, Shops, Admin. Bldgs	\$12,000	\$12,000	\$27,000	\$12,000	\$12,000	\$27,000	\$27,000
40 Sitework, Right Of Way, Land, Existing Improvements	\$1,416,000	\$1,348,000	\$1,205,000	\$1,325,000	\$1,138,000	\$1,218,000	\$1,318,000
50 Communica- tions & Signaling	\$151,000	\$129,000	\$116,000	\$156,000	\$140,000	\$117,000	\$135,000
60 Electric Traction	\$486,000	\$417,000	\$374,000	\$504,000	\$452,000	\$378,000	\$440,000
70 Vehicles	Considered a systemwide cost and not included as part of individual HST study alternatives						
80 Professional Services (applies to Categories 10-60)	\$723,000	\$637,000	\$561,000	\$511,000	\$461,000	\$393,000	\$509,000
90 Unallocated Contingency	\$251,000	\$222,000	\$197,000	\$178,000	\$162,000	\$141,000	\$180,000
100 Finance Charges	Estimate to be developed prior to project construction						
Total	\$6,694,000	\$5,943,000	\$5,279,000	\$4,817,000	\$4,379,000	\$3,827,000	\$4,838,000

S.8.5 Section 4(f) Resources

Section 4(f) properties are publicly owned parks, recreation areas, or wildlife and waterfowl refuges or properties of a historical site of national, state, or local significance as determined by the federal, state, regional, or local officials having jurisdiction over the resource. Section 4(f) is defined in 49 United States Code (U.S.C.) 303 and stipulates that an operating agency of the U.S. Department of Transportation may not approve a project that uses properties protected under this section of the law unless there are no prudent or feasible alternatives and the project includes all possible planning to minimize harm to such properties.

As shown in Table S-3, the UPRR/SR 99 Alternative would result in the use of seven Section 4(f) resources, including three park and recreation resources and four cultural resources. The BNSF and Hybrid alternatives would each result in the use of three Section 4(f) resources (all cultural resources). Construction of the Castle Commerce Center HMF site access tracks would result in a use of Joe Stefani Elementary School, as the entire property would need to be acquired. There may be a prudent avoidance alternative to the use of land from the Joe Stefani Elementary School and other HMF alternatives are available that do not use Section 4(f) properties.

Table S-3
Potential Uses of Section 4(f) Resources Differentiating Among HST Alternatives

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options							
	UPRR/SR 99 Alternative		Hybrid Alternative		BNSF Alternative			
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Mariposa Way Design Options		Mission Ave Design Options	
					Le Grand	East of Le Grand	Le Grand	East of Le Grand
Number of Section 4(f) Uses – Park/Recreation Resources								
North-South Alignment	3 ^a	3 ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a
With Ave 24 Wye	3 ^a	3 ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a
With Ave 21 Wye	3 ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a	NA ^a
Number of Section 4(f) Uses – Cultural Resources								
North-South Alignment	4	4	3	3	3	3	3	3
With Ave 24 Wye	4	4	NA	3	3	3	3	3
With Ave 21 Wye	4	NA	3	NA	3	3	3	3
^a Impacts to Camp Pashayan from this alternative were determined to be <i>de minimis</i> .								

FRA has determined that project impacts on Camp Pashayan in Fresno would be *de minimis* use as defined in 49 U.S.C. 303(d) and continues to work with CDFG staff to obtain written concurrence with this finding. FRA preliminarily determined in the Draft EIR/EIS that the UPRR/SR 99 Alternative would have a *de minimis* impact on Riverside Park; however, the agency with jurisdiction over the resource did not agree with the findings. The *de minimis* impact determination for Camp Pashayan includes measures to minimize harm, mitigation, or enhancement (49 U.S.C. 303(d)(1)(C)). These measures, such as restoring impacted portions of the property after construction, using sound-attenuating measures along the guideway to minimize noise, and coordinating construction activities to avoid scheduled weekend activities when appropriate, would be incorporated into the project design. With these measures, the Authority and FRA have determined that the project would not adversely affect the activities, features, or attributes of the resource.

The alternatives evaluation process conducted as part of the HST Project for the Merced to Fresno Section concluded that there was no feasible and prudent HST alternative within the study area that would address the project purpose and need without the use of a Section 4(f) resource. Although the alternatives analysis process considered multiple criteria, the screening emphasized the project objective to maximize the use of existing transportation corridors and available rights-of-way, to the extent feasible; the result of this was the carrying forward of the north-south alignment alternatives that follow the two existing freight corridors of the UPRR and the BNSF. The alternatives evaluation process resulted in the conclusion that, in accordance with 49 U.S.C. 303(c), there was no feasible and prudent HST alternative within the study area that, based on multiple factors which are individually not severe, would cumulatively result in conditions rendering the alternative not prudent.

The Section 4(f) Evaluation concludes that the Hybrid Alternative would have the overall least harm in light of the statute's preservation purpose based on an assessment of the factors contained in 23 CFR §774.3(c)(1).

S.8.6 Section 6(f) Resource

The HST Project would not convert any parkland from a Section 6(f)-protected resource.

S.9 Areas of Controversy

According to the scoping meetings and public outreach efforts throughout the environmental review process, the following are known areas of controversy:

- Selection of the HMF site.
- Selection of the HST alignment connecting the Merced to Fresno Section to the west (wye connection).
- Impacts on wildlife habitat preserves along the BNSF corridor.
- Impacts on corridor communities (including noise, visual quality impacts, loss of community character and cohesion, and right-of-way acquisition).
- Impacts on farmlands (including severance of farmlands, loss of productive farmland, and loss of agricultural enterprises).
- Trade-offs between community impacts of elevated HST guideway through Chowchilla and at-grade guideway around Chowchilla.

S.10 Draft EIR/EIS Circulation and Review

The Merced to Fresno Section Draft EIR/EIS was circulated with an extended 60-day review period, which closed October 13, 2011. Several advertised public workshops were held in the project area during the

review period to present the Draft EIR/EIS and to give the public an opportunity to ask questions and collect information about the project. Four public workshops were held during the last week of August in Chowchilla, Fairmead, Fresno, and Le Grand, at which members of the public could review copies of the Draft EIR/EIS and obtain help in identifying how the project might affect their property. Formal hearings were held in Merced, Madera, and Fresno and written and verbal comments accepted on September 14, 15, and 20, 2011.

The Draft EIR/EIS was made available for review in several ways. The document was posted on the Authority's web site beginning on August 9, 2011. Printed and electronic copies were made available in 12 libraries and community centers located in Atwater, Chowchilla, Fairmead, Fresno, Le Grand, Los Banos, Madera, Madera Ranchos, Merced, and Planada (see Chapter 9). Copies were sent to cooperating federal agencies, state responsible and trustee agencies (including copies sent through the State Clearinghouse), and were available at the Authority's office in Sacramento. DVDs with the Draft EIR/EIS in electronic form were sent, without charge, to all who requested them.

Chapter 8.0, Public and Agency Involvement, of this Final EIR/EIS contains a list of all public and agency meetings held to date (Table 8-1), and Volume IV, Response to Comments, contains a summary of commonly received comments and responses to these comments, as well as a list of the comments received after the close of the Draft EIR/EIS comment period on October 13, 2011. The formal review period did not limit the consideration of comments received from agencies, organizations, and the public after the end of the comment period. The Authority and FRA considered comments received after October 13, 2011, and reproduced or summarized them in this Final EIR/EIS. Volume IV also includes copies of all public and agency comments received during the comment period and responses to these comments.

S.10.1 Public and Agency Comment Summary

During the comment period, there were 895 comment submittals on the Merced to Fresno Section Draft EIR/EIS. The comments covered a wide range of issues and represented viewpoints from government agencies, organizations, business groups, businesses, residents, and property owners.

Most expressed support or opposition opinions about the project or its alternatives. Of the 895 submittals, approximately 107 generally supported and 127 were generally opposed to the project. Most comments came from individuals in the general public living, working, or with property interests in the project study area. Nearly two-thirds of the comments submitted concerned the UPRR/SR 99 Alternative. Few preferred the BNSF Alternative; most comments on the BNSF Alternative expressed opposition to this alternative. Only a few comments mentioned the Hybrid Alternative by name.

Among comments received from the general public, effects on community resources and agricultural and private property were the top concerns about the project. Also, comments expressed concern over the project cost estimates, funding availability (including whether any money should be spent on this type of project in light of state and federal budget deficits), and questions regarding the accuracy of the ridership projections. Common issues also covered safety at stations, station access limitations for vehicles and pedestrians, and connectivity to ultimate destinations upon arriving at HST stations. Other common environmental concerns included noise and vibration, ecosystem effects, neighborhoods, and construction effects.

Affected Jurisdictions generally listed their preference. The City and County of Merced preferred the UPRR/SR 99 Alternative. The City of Madera preferred the BNSF Alternative, while Madera County preferred the UPRR/SR 99, but supported the Hybrid Alternative as well. Other agencies generally confined their comments to concerns about their resources and the pertinent analysis. This included the U.S. Environmental Protection Agency and the U.S. Army Corp of Engineers (USACE). However, USACE did mention that the BNSF Alternative would not likely qualify as the Least Environmentally Damaging Practicable Alternative. Businesses generally commented on specific property impact issues. Comments were received from 43 special interest or community organizations representing their environmental or farming interests. Some groups organized in response to this project, one of which, the Madera Friends

of High-Speed Rail, collectively sent in 22 submittals with 1,113 individual comment letters supporting the UPRR/SR 99 Alternative because of the perceived benefit to the City and the region.

S.10.2 Identification of Preferred Alternative

The Authority and FRA have identified the Hybrid Alternative as the Preferred Alternative for the north-south connection between Merced to Fresno, including the Downtown Merced Station and the Mariposa Street Station Alternative for the Downtown Fresno Station. Due to influencing factors from adjacent sections, the identification of the preferred wye option and the HMF are being postponed until after the Fresno to Bakersfield Section and the San Jose to Merced Section environmental evaluation processes are completed. The Authority and FRA have prepared this Merced to Fresno Section Final EIR/EIS that includes responses to comments and a description of the preferred alternative and proposed mitigation. In identifying the preferred alternative, all three east-west alignments and wyes will be further considered in the San Jose to Merced Section EIR/EIS.

S.10.2.1 Preferred Alternative Alignment

The Hybrid Alternative would have natural resource impacts generally similar to the UPRR/SR 99 Alternative and fewer impacts than the BNSF Alternative. The Hybrid Alternative would result in fewer effects on community resources than either of the other two alternatives but substantially less than the UPRR/SR 99 Alternative, for which impacts would be exacerbated during construction for impacts such as noise, dust, air quality, and reduced access to parks and businesses. Overall, in balancing the effects on natural and community resources, the Hybrid Alternative minimizes environmental impacts the most. The Hybrid Alternative represents the least constructability issues, which is also reflected in being the lowest cost alternative, at approximately \$450 million less than the BNSF Alternative and over \$1 billion less than the UPRR/SR 99 Alternative. This is because the Hybrid Alternative is shorter than the BNSF Alternative and has less elevated guideway and fewer impacts on adjacent infrastructure than the UPRR/SR 99 Alternative. The Hybrid Alternative offers the second best travel time, taking only 30 seconds longer between San Francisco and Los Angeles, a minute more between Merced and Fresno, and the same amount of time between San Francisco and Merced compared to the UPRR/SR 99 Alternative. The BNSF Alternative would have the same travel time as the Hybrid Alternative between San Francisco and Los Angeles, but otherwise it would take as much as 4 minutes longer than the other two alternatives. Overall, the Hybrid Alternative best meets the regulatory requirements and wishes of the majority of the public by minimizing impacts on the environment, farmland, and communities. It would avoid the greater impacts on the environment and rural communities in Merced County that would occur with the BNSF Alternative, and would avoid the greater impacts on more urban areas along the UPRR/SR 99 Alternative, such as in the City of Madera.

S.10.2.2 Stations

The preferred stations have been identified as the Downtown Merced Station and the Mariposa Street Station Alternative for the Downtown Fresno Station. The City of Merced worked closely with the project team and, as such, there is only one preferred location for the Downtown Merced Station. The preferred station for the City of Fresno is the Mariposa Street Station Alternative. Based on cooperation with the City of Fresno, the Mariposa Street Station Alternative provides the best opportunity for enhancement of land use densities consistent with the City's current planning for transit-oriented development in the draft *Fulton Corridor Specific Plan* and the draft *Downtown Neighborhoods Plan* (City of Fresno 2011a,b, respectively). Additionally, there were relatively minor differences in the impacts between the two stations.

S.11 Summary of Changes between the Draft and Final EIR/EIS

Changes to the EIR/EIS were made primarily in response to public comments on the Merced to Fresno Section Draft EIR/EIS (Authority and FRA 2012a). Some changes are the result of advancing the design

south of the San Joaquin River from 15% to 30%, as well as ongoing coordination with local jurisdictions and regulatory agencies. In addition, the Bureau of Reclamation was added as a cooperating agency under NEPA. Generally, the design and mitigation measures have been refined to minimize and avoid impacts. The following is a summary of changes made between the Draft and Final EIR/EIS, presented by chapter and section.

Executive Summary

The Executive Summary was updated for the Final EIR/EIS to present data and conclusions using the updated data (specific changes are summarized by resource area below).

Chapter 1.0, Project Purpose, Need, and Objectives

- Updated the discussion of the HST environmental review process. Included EPA and USACE Least Environmentally Damaging Practicable Alternative (LEDPA) concurrence letters (March 23, 2012, and March 26, 2012, respectively (EPA 2012 and USACE 2012).
- Revised discussion of applicable air quality regulations. Revised air quality and GHG emissions to focus on general conformity rather than transportation conformity.
- Expanded explanation of tiering off Program EIR/EIS Documents.
- Added discussion addressing the Revised 2012 Business Plan published in April 2012, which describes the phased HST program implementation.

Chapter 2.0, Alternatives

Footprint changes are a result of advanced engineering design in Fresno (15% to 30%), design refinement, and public and agency comments on the Draft EIR/EIS. The following changes were made based on further design refinements, as well as comments received and coordination with the City of Fresno, County of Madera, Caltrans, and USACE:

- Made a slight shift of the Merced Station to accommodate emergency access that also resulted in a slight shift of Castle Commerce Center HMF access tracks.
- Changed Road 20 from closed to open and changed Ave 23 ½ from open to closed, in the HST condition for certain alternatives due to HST alignment and roadway modifications (Hybrid and BNSF Alternatives with Ave 24 Wye).
- Elevated HST tracks over Raymond Road and SR 145 at the Fresno River crossing, rather than lowering SR 145 as previously planned.
- Reconfigured overcrossings at Ave 25 and Ave 24 ½ (Hybrid) to avoid impacts to two dairy facilities.
- Modified roadway overcrossings along the Hybrid Avenue 21 and Hybrid Avenue 24 alignments to reduce impacts on waters of the U.S.
- Added easements for power line upgrades between existing substations and the HST electrical system.
- Added option for an HST crossing of the San Joaquin River with clear-span bridge.
- Added a new overcrossing at Shaw Avenue.
- Made road modifications in the vicinity of the proposed Fresno Station, including traffic rerouting, over- and undercrossings, and pedestrian walkways. Road modifications also included anticipated changes to the Transportation Element of the Fresno General Plan.

- Extended the project southerly limit from Santa Clara Street to San Benito Street to improve the analytical context. Temporary footprint extends south of San Benito Street to include a shoofly (i.e., detour of existing railroad tracks during construction). Included dedicated wildlife crossings in the project design.
- Changed all track construction to a combination of ballast and slab.
- Implementation of the Sustainability Memorandum of Understanding (Authority, FRA, U.S. Housing and Urban Development, Federal Transit Administration, and EPA. 2011.)
- In response to public comments, added detail about consideration and elimination of an I-5 alternative during the alternatives analysis process.

Chapter 3.0, Affected Environment, Environmental Consequences, and Mitigation Measures

Most sections of Chapter 3.0 were revised as applicable, including updating data and analysis based on changes to the project description listed above for Chapter 2.0, Alternatives. Some changes were made in response to public and agency comments, and some reflected ongoing coordination with agencies and local jurisdictions. Changes also included refinement of mitigation measures and commitments to implement them. The evaluation of air quality and energy effects now describes impacts based on ridership levels in two scenarios: one setting HST ticket prices at 50% of airfare and the other setting HST ticket prices at 83% of airfare. Generally, the revised analyses provided additional clarification and detail. Typically, design or construction refinements did not change the level of impacts reported in the Draft EIR/EIS. In some cases, however, impacts are reduced, such as for construction emissions for air quality and wildlife movement. To facilitate public review of the revisions, specific changes to resource area discussions are listed below.

Section 3.2-Transportation

The following changes were made based on further design refinements, as well as comments received and coordination with the City of Fresno:

- Traffic patterns near the Downtown Fresno Station changed with updated project description.
- Five new intersections and two new roadways were added to the traffic analysis for future conditions (not changes in the footprint). Impacts on these intersections with substantial intensity under NEPA and significant impacts under CEQA would be reduced to moderate intensity under NEPA and less than significant under CEQA with mitigation.
- Four new intersections were added to the traffic analysis for existing conditions (not changes in the footprint). Impacts on these intersections with substantial intensity under NEPA and significant impacts under CEQA would be reduced to moderate intensity under NEPA and less than significant under CEQA with mitigation.

Section 3.3-Air Quality and Global Climate Change

The following changes were made to this section in response to public comments and design refinements:

- Construction emissions were updated to reflect the refined construction schedule and other construction information. This update resulted in emission decreases compared to emissions presented in the Draft EIR/EIS. Previously, VOC, NO_x, PM₁₀, and PM_{2.5} were expected to exceed CEQA and/or General Conformity thresholds. With the new updates, VOC and NO_x would be the only pollutants that exceed CEQA or General Conformity thresholds in certain construction years before mitigation. The revised mitigation measures, including a Voluntary Emissions Reduction Agreement (VERA) between the Authority and the SJVAPCD, would be used to offset the NO_x and VOC significant

impacts from the project construction. With the construction schedule reduction/revision, GHG emissions from construction also went down.

- Track construction was changed from 100% ballast and sub-ballast to a combination of ballast and slab. Previously, to be conservative, it was assumed that all ballast and sub-ballast would be hauled from outside the SJVAB. With the new design, concrete slabs and sub-ballast required for project construction would be available within the air basin. These changes resulted in emission reductions from material hauling outside of the SJVAB. As a result, emissions would exceed applicable thresholds in fewer air basins (outside the SJVAB) than indicated in the Draft EIR/EIS. Mitigation also was identified to reduce remaining impacts to less than significant.
- Project operation emissions results were augmented to add the HST ridership scenario based on HST ticket prices at 83% of airfare, in addition to the 50%-of-airfare scenario in the Draft EIR/EIS, to bracket the anticipated benefits.
- An Air Quality General Conformity Determination, which is required by federal law because of FRA funding prior to project construction, was prepared to accompany the issuance of the ROD by FRA. A draft Determination accompanies the Final EIR/EIS.

Section 3.4-Noise and Vibration

The following change was made to this section as a result of design refinements and to address public comments:

- Slab track would be 3 decibels (dB) louder than ballast and tie track because of the decreased acoustic absorption compared to that provided by the ballast and changes to the track stiffness. This change increased the number of severe impacts for all HST alternatives and resulted in longer sound barriers for mitigation.

Section 3.5-Electromagnetic Fields and Electromagnetic Interference

Based on project design/planning refinement, the following change was made to this section:

- Information was added regarding implementation of the Electromagnetic Compatibility Program Plan. This eliminated an impact with significant intensity under NEPA (health risk to workers with implanted medical devices when entering traction power substations).

Section 3.6-Public Utilities and Energy

The following changes were made to this section based on further project design/planning:

- The estimated change in energy consumption was re-calculated using the 50% and 83% fare scenarios; regeneration was added to the projections of energy use; and the figures were updated based on new energy use estimates and California's 2010 energy consumption. The significance and intensity conclusions did not change.
- The project-related solid waste generation for the HST stations was re-calculated based on the Authority's established goal of a 75% diversion rate. This reduced the estimates of annual waste generation.

Section 3.7-Biological Resources and Wetlands

- Indirect impact acreages for riparian communities and jurisdictional waters were provided in response to USACE comments on the Draft EIR/EIS.
- The discussions of impact acreages for vernal pools and seasonal wetlands were separated in response to USACE comments on the preliminary jurisdictional determination submitted in conjunction with the Section 404 draft permit application in August 2011.

- The discussion of habitat connectivity and wildlife corridors was updated to reflect the design refinement that includes dedicated wildlife crossings. Impacts would be reduced to negligible intensity under NEPA and less than significant under CEQA with the inclusion of these design refinements.

Section 3.8-Hydrology and Water Resources

- No substantive changes

Section 3.9-Geology, Soils, and Seismicity

- All track construction was changed to a combination of ballast and slab, and the ability to obtain sub-ballast within the basin was confirmed.

Section 3.10-Hazardous Materials and Wastes

Based on comments received during the comment period, the following change was made to this section and did not result in a change to impacts.

- A discussion of potential effects on 10 oil wells in the study area was added in response to a comment from the California Department of Conservation, Division of Oil, Gas and Geothermal Resources. No impacts were identified.

Section 3.11-Safety and Security

- No substantive changes

Section 3.12-Socioeconomics, Communities, and Environmental Justice

- Based on public comments, a memo was prepared to address children's health and safety issues. None of the alternatives would result in impacts of substantial intensity.
- Additional analysis and information was provided regarding school district impacts. The displacements of residential properties are not anticipated to negatively affect schools or school district funding because of a decrease in school district attendance or loss of property tax revenues.

Section 3.13-Station Planning, Land Use, and Development

- No substantive changes

Section 3.14-Agricultural Lands

Based on comments received during the public comment period, the following change was made to this section:

- Additional information regarding noise effects on grazing animals was provided. Related impacts would have negligible intensity under NEPA and would be less than significant under CEQA.

Section 3.15-Parks, Recreation, and Open Space

Based on comments received during the public comment period, the following changes were made to this section:

- Information was added on the planned Vern McCullough Fresno River Trail extension. If the extension is constructed before the HST Project, the trail would be partially closed during construction, but no permanent impacts would ensue.
- Information was added addressing potential noise and vibration impacts to animals at the Chaffee Zoo in Roeding Park, Fresno. This would not result in additional impacts.

Section 3.16-Aesthetics and Visual Resources

- No substantive changes

Section 3.17-Cultural and Paleontological Resources

- Based on comments received during the public comment period, coordination with cities and State Historic Preservation Officer (SHPO), field testing, and footprint refinements, the following changes were made to this section:
 - Based on input from the City of Fresno, the Belmont Avenue Subway and Traffic Circle adjacent to Roeding Park were reassessed and the project was found to have an adverse effect.
 - Based on project design refinement, the footprint was revised to avoid impacts onto Forestiere Underground Gardens. This changed a previous adverse effect with direct intensity under NEPA to no adverse effect.
 - The impact to a historic property in Chowchilla (24302 Road 15) changed from indirect adverse effect to no effect.
 - Detail was added regarding SHPO concurrence with the Historic Properties Survey Report (Authority and FRA 2012b), Historic Architectural Survey Report (Authority and FRA 2012c) (both March 13, 2012) and the Archaeology Survey Report (Authority and FRA 2012d) (March 21, 2012).

Section 3.18- Regional Growth

- No substantive changes

Section 3.19-Cumulative Impacts

- No substantive changes

Chapter 4.0, Final Section 4(f)/6(f) Evaluation

- The alternatives evaluation process conducted as part of the Merced to Fresno HST Project Section concluded that there was no feasible and prudent HST alternative within the study area that did not result in a use of a Section 4(f) resource. Because there is no feasible and prudent avoidance alternative that avoids a use of all Section 4(f) resources, the only alternative that can be approved is the one that causes the least overall harm. The least-harm analysis demonstrates that the Hybrid Alternative would have the least harm under Section 4(f).
- There would be no Section 4(f) use of the SPRR depot in Fresno associated with the HST alternatives or the Mariposa Street Station Alternative.

Chapter 5.0, Project Costs and Operations

- Operational costs were refined.

Chapter 6.0, CEQA/NEPA Decision Process and Other Considerations

- The analysis was updated to reflect that fewer unavoidable impacts remain after mitigation (in accordance with updates in Chapter 3.0).

Chapter 7.0, Preferred Alternative and Stations

- Chapter was added to this Final EIR/EIS to present the Authority's and FRA's Preferred Alternative. The Authority and FRA select the Hybrid Alternative with the Downtown Station in Merced and the Mariposa Station in Fresno as the Preferred Alternative. USACE and EPA concurred (on March 26, 2012 and March 23, 2012, respectively) that the Hybrid Alternative is the least environmentally damaging practicable alternative (LEDPA), consistent with USACE's permit program (33 CFR Part 320–331) and EPA's Section 404(b)(1) Guidelines (40 CFR 230–233).
- The Authority and FRA have not identified a preferred alternative for the wye option at this time. This will be determined as part of the San Jose to Merced Section EIR/EIS document which will evaluate three wye options, all connecting to the Hybrid Alternative.
- The Authority and FRA have not identified a preferred alternative for an HMF site at this time. This decision will be deferred to a later date as part of the San Jose to Merced Section EIR/EIS document because the selection of the HMF may be affected by the selection of the wye and the Fresno to Bakersfield Section EIR/EIS process, which will also consider HMF alternatives.

Chapter 8.0, Public and Agency Involvement

- This chapter was updated for this Final EIR/EIS to include meetings and consultation that occurred after the Draft EIR/EIS was published and to present a summary of the comments received and the responses to common comments.

Chapter 9.0, EIR/EIS Distribution

- This chapter was updated to include distribution of the Draft EIR/EIS after publication and distribution of this Final EIR/EIS.

Other Chapters and Volumes

- Chapter 10.0, List of Preparers; Chapter 11.0, References; Chapter 12.0, Glossary of Terms; Chapter 13.0, Index; and Chapter 14.0, Acronyms and Abbreviations were updated as necessary.
- Volume II: Technical Appendices, was updated with associated changes listed in previous bullets as applicable, and changes were reflected in the main text. Added appendices include:
 - 3.3-A: Potential Impact from Induced Winds for High-Speed Trains
 - 3.3-B: Draft General Conformity Determination
 - 3.6-A: Water Consumption Technical Memorandum
 - 3.6-B: Drawdown Calculations for 35-gpm Well in Chowchilla Area
 - 3.8-A: Berenda Reservoir Technical Memorandum
 - 3.10-A: Potential Impacts on Schools from Hazardous Materials
 - 3.12-B: Effects on School District Funding and Transportation Bus Routes
 - 3.12-C: Children's Health and Safety Risk Assessment
 - 3.12-D: Summary of Issues/Concerns Affecting Schools
 - 3.13-B: Land Use and Communities Technical Memorandum
 - 3.14-A: Results and Findings of Land Evaluation and Site Assessment (LESA) Pursuant to the FPPA (7 CFR 658)

- 3.14-B: Impacts on Confined Animal Agriculture Technical Memorandum
- 3.14-C: High-Speed Train Noise Impacts on Grazing Technical Memorandum
- Volume III: Alignments and Other Plans, updated with footprint changes associated with the design refinements discussed above.
- Volume IV: Comments and Responses to the Draft EIR/EIS, added to present the comments and responses on the Draft EIR/EIS and responses to those comments.

S.12 Next Steps in the Environmental Process

Notices of availability of the Final EIR/EIS were published, and the document was distributed and made available to agencies and the public on April 20, 2012. Before the Authority and FRA make decisions regarding the project, CEQA and NEPA require that each lead agency makes specific findings and determinations regarding the project alternatives, potential impacts, mitigation measures, and conformance with specific environmental laws. Using these findings and determinations, and considering the entire Administrative Record that includes comments received on the Final EIR/EIS, the Authority and FRA will prepare CEQA and NEPA decision documents approving the completion of the environmental review process and selecting the project alternative to be implemented. Following publication of these decision documents, the Authority will begin implementation of the selected alternative by preparing the final design, obtaining necessary environmental permits, and beginning the process of acquiring property for the project. Anticipated timing of the next environmental steps follow:

- Authority Board consideration of whether to certify the Final EIR/ EIS, approve the project, make the related Decision, and issue the Notice of Determination: May, 2012
- ROD by FRA: June 2012
- Final design and permitting: 2012/2013
- Property acquisition begins: Dec 2012

S.12.1 Federal Railroad Administration Decision-making

Upon completion of the environmental process with publication of the Merced to Fresno Section Final Project EIR/EIS, the FRA expects to issue a Record of Decision (ROD) for compliance with NEPA. The ROD will describe the project and alternatives considered, describe the selected alternative; make environmental findings and determinations with regard to air quality conformity, Endangered Species Act, Section 106, Section 4(f), and environmental justice; and require project mitigation measures. Issuance of the ROD is a prerequisite for any federal construction funding or approvals.

S.12.2 California High-Speed Rail Authority Decision-making

After completion of the environmental process, the Authority will consider whether to certify the Final Project EIR/EIS for compliance with CEQA. Once the Authority certifies the Final Project EIR/EIS, it can approve the project and make related CEQA decisions (findings, mitigation plan, and potential statement of overriding considerations). The required CEQA findings prepared for each significant effect will be one of the following:

- Changes or alternations have been required or incorporated into the project that avoid or substantially lessen the significant environmental effect as identified in the Final EIR.
- Changes or alternations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency.

- Specific economic, legal, social, technological, or other considerations, including provision of employment opportunities for highly trained workers, make infeasible the mitigation measures or HST alternatives identified in the Final EIR.

If the Authority proceeds with approval of the project, the Authority would file a Notice of Determination (NOD) that describes the project and whether the project will have a significant effect on the environment. If the Authority approves a project that will result in the occurrence of significant effects identified in the Final EIR but not avoided or substantially lessened, CEQA requires the preparation of a Statement of Overriding Considerations which provides specific reasons to support the project, including economic, legal, social, technological, or other benefits of the proposed project that outweigh unavoidable adverse environmental effects. If such a statement is prepared, the Authority's NOD will reference the statement.

For purposes of this Merced to Fresno Section Project EIR/EIS, project approval would include selection of a north-south alignment alternative and selection of station locations. The Authority will carry forward all east-west alignment alternatives and wyes for further study and consideration as part of the San Jose to Merced Section Project EIR/EIS. A decision on the east-west alignments and wyes would be made in the future, at the conclusion of the San Jose to Merced Section Project EIR/EIS process.

The Authority will not identify a preferred HMF facility from among the HMF alternatives examined in the EIR/EIS at this time. The Authority will consider the HMF facility alternatives as part of the Fresno to Bakersfield Section Project EIR/EIS and anticipates identifying a preferred HMF facility from among the alternatives in that Project EIR/EIS. The HMF site selection will be deferred until after the evaluation of alternatives in the San Jose to Merced Section EIR/EIS, and the alignment of the wye has been determined. A final decision on the HMF facility site will be based on the Authority's consideration of the preferred HMF alternatives from both the San Jose to Merced and Fresno to Bakersfield sections.

S.12.3 U.S. Army Corps of Engineers Decision-making

The Merced to Fresno Section of the HST System will require a permit from the USACE under Section 404 of the Clean Water Act and Section 14 of the Rivers and Harbors Act (33 U.S.C. 408). The USACE is using the Merced to Fresno Section Project EIR/EIS to integrate the procedural and substantive requirements of NEPA and its permitting responsibilities (including the U.S. Environmental Project Agency's 404(b)(1) Guidelines) to provide a single document that streamlines and enables informed decision-making by the USACE, including but not limited to, adoption of the EIS, issuance of necessary RODs, Section 404 permit decisions, and Section 408 permit decisions (as applicable) for alteration/modification of completed federal flood risk management facilities and any associated operation and maintenance, and real estate permissions or instruments (as applicable). EPA and USASCE issued letters identifying the Hybrid Alternative as the preliminary LEDPA (March 23, 2012, and March 26, 2012, respectively (EPA 2012, USACE 2012).

S.12.4 Project Implementation

After the issuance of FRA's ROD and the Authority's Notice of Determination, the Authority would complete final design, obtain construction permits, and acquire property prior to construction. Property acquisition is anticipated to commence in 2012 with initial construction activities beginning in 2013. Construction of rail segments is expected to conclude in 2017. The major construction activities are expected to occur between 2013 and 2019, with construction of the stations completed by 2022.

The following tables provide information used to compare and differentiate among alternatives:

- Tables S-4 shows impacts that differentiate among north-south alignments and design options.
- Table S-5 provides a comparison of potential adverse effects of alternatives.
- Table S-6 shows differentiating impacts for the HMF alternatives.

Table S-4
Impacts That Differentiate Among North-South HST Alternatives and Design Options

HST Alternatives and Design Options									
North-South Alignment Isolated and with Wye Design Option	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative		
	East Chowchilla Design Option			West Chowchilla Design Option			Mariposa Way Design Options		Mission Ave Design Options
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand	
TRANSPORTATION									
Construction-Period Impacts – No differentiating significant construction-period impacts between alternatives									
Project Impacts									
Permanent Road Closures									
North-South Alignment	9	18	18	18	31	25	16	20	15
With Ave 24 Wye	19	28	28	NA	36	42	33	37	32
With Ave 21 Wye	21	NA	NA	30	NA	38	29	33	28
AIR QUALITY AND GLOBAL CLIMATE CHANGE									
Construction-Period Impacts									
Construction-related Pollutant Emissions									
North-South Alignment	Greatest amount of construction-related pollutants			Smallest amount of construction-related pollutants			Construction-related pollutants between UPRR and Hybrid		
With Ave 24 Wye									
With Ave 21 Wye									
Project Impacts – No differentiating significant operations impacts between alternatives									

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options								
	UPRR/SR 99 Alternative			Hybrid Alternative		BNSF Alternative			
						Mariposa Way Design Options		Mission Ave Design Options	
NOISE AND VIBRATION									
Construction-Period Impacts – No differentiating significant construction-period impacts between alternatives									
Project Impacts									
Number of Residences Affected by Severe Noise Impacts Before Mitigation									
North-South Alignment	976	1,138	468	498	756	476	665	488	
With Ave 24 Wye	1,134	1,149	NA	509	859	579	768	591	
With Ave 21 Wye	1,024	NA	520	NA	821	541	730	553	
Number of Non-Residential Locations Affected by Severe Noise Impacts Before Mitigation									
North-South Alignment	13	13	5	5	5	5	5	5	
With Ave 24 Wye	16	14	NA	5	5	5	5	5	
With Ave 21 Wye	15	NA	5	NA	5	5	5	5	
Number of Locations with Vibration Effects Before Mitigation									
North-South Alignment	0	0	0	0	0	1	0	1	

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

HST Alternatives and Design Options									
North-South Alignment Isolated and with Wye Design Option	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative		
							Mariposa Way Design Options		Mission Ave Design Options
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand	
With Ave 24 Wye	0	0	NA	0	0	1	0	1	1
With Ave 21 Wye	0	NA	0	NA	0	1	0	1	1
ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE – NO SIGNIFICANT IMPACTS									
PUBLIC UTILITIES AND ENERGY									
Construction-Period Impacts – No significant construction-period impacts									
Project Impacts									
Conflicts with Existing Substation									
North-South Alignment	0	0	1	1	1	1	1	1	1
With Ave 24	0	0	NA	1	1	1	1	1	1
With Ave 21	1	NA	2	NA	2	2	2	2	2
BIOLOGICAL RESOURCES AND WETLANDS ^a									
Construction-Period Impacts									
Direct Temporary Impacts on Habitat with Potential to Support Special-status Plant Species (acres) ^{b,c}									
North-South Alignment	68.03/69.21 ^d	64.04	54.73	46.79	99.47/91.10	87.66/79.29	76.17/67.80	78.50/70.13	
With Ave 24	70.23	64.94	NA	47.69	94.45	82.64	71.15	73.48	

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			Mission Ave Design Options
	East Chowchilla Design Option	West Chowchilla Design Option	NA	East Chowchilla Design Option	West Chowchilla Design Option	NA	Le Grand	East of Le Grand	Le Grand	
With Ave 21	74.55	NA	NA	59.05	NA	NA	100.10	88.29	76.80	79.13
Direct Temporary Impacts with Potential to Support Special-status Wildlife Species (acres) ^{b,c}										
North-South Alignment	231.55/231.48	232.52		194.43	199.19		167.46/159.44	155.13/147.11	151.09/143.07	154.59/146.57
With Ave 24	289.26	252.13		NA	241.43		235.70	223.37	219.33	222.83
With Ave 21	248.82	NA		216.08	NA		182.37	170.03	165.99	169.49
Direct Temporary Impacts Waters of the US (aquatic communities) (acres) ^{b,e,f}										
North-South Alignment	12.58/12.55	11.73		11.39	10.86		6.56/6.80	6.82/7.06	6.25/6.50	6.64/6.89
With Ave 24	13.74	12.24		NA	11.33		8.65	8.91	8.35	8.74
With Ave 21	13.24	NA		11.82	NA		6.78	7.04	6.47	6.86
Direct Temporary Impacts on Vernal Pools, and Seasonal Wetlands (acres) ^{b,e,f}										
North-South Alignment	NA	NA		NA	NA		NA	NA	NA	NA
With Ave 24	NA	NA		NA	NA		NA	NA	NA	NA
With Ave 21	NA	NA		NA	NA		NA	NA	NA	NA
Direct Temporary Impacts to Great Valley Mixed Riparian and other Riparian Communities (acres)										
North-South Alignment	4.72/4.71	3.64		4.29	3.51		3.13/2.90	3.33/3.10	2.24/2.00	2.37/2.13

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			
							Mariposa Way Design Options		Mission Ave Design Options	
With Ave 24	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand	2.66	2.38
With Ave 21	4.74	NA	4.3	NA	3.14	3.34	2.25			
								Project Impacts		
Direct Permanent Impacts on Habitat with Potential to Support Special-status Plant Species (acres)										
North-South Alignment	151.75/151.84	158.52	215.75	211.30	311.58/320.16	266.13/274.72	346.70/355.28	300.03/308.61		
With Ave 21	189.34	NA	237.84	NA	328.98	283.54	364.10	317.43		
									Direct Permanent Impacts on Habitat with Potential to Support Special-status Wildlife Species (acres)	
North-South Alignment	503.97/498.79	643.83	604.93	742.27	540.74/549.69	508.62/517.56	662.42/671.37	623.55/632.50		
With Ave 21	657.92	NA	724.02	NA	691.10	658.97	812.78	773.91		
									Direct Permanent Impacts on Waters of the U.S. (aquatic communities) (acres) ^{c,f}	
North-South Alignment	17.48/17.54	25.04	17.59	24.03	17.82/17.98	19.36/19.52	21.32/21.48	23.02/23.18		
With Ave 21	32.53	NA	31.79	NA	26.44	27.98	29.93	31.64		
									Direct Permanent Impacts on Vernal Pools and Seasonal Wetlands (acres) ^{b,e,f}	

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			Mission Ave Design Options
	East Chowchilla Design Option	West Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand	
North-South Alignment	2.01/1.94	2.10		2.68	3.76	17.09/ 16.99	13.20/ 13.09	17.81/ 17.71		17.49/17.39
With Ave 24	1.94	2.12		NA	3.79	17.37	13.48	18.09		17.78
With Ave 21	2.52	NA		2.73	NA	17.33	13.43	18.05		17.73
Direct Permanent Impacts on Great Valley Mixed Riparian and other Riparian Communities (acres)										
North-South Alignment	4.14/4.14	8.39		3.86	6.19	5.77/6.11	7.11/7.44	4.19/4.53		4.10/4.44
With Ave 24	10.71	13.90		NA	11.34	9.44	10.78	7.86		7.77
With Ave 21	4.55	NA		4.27	NA	6.22	7.55	4.64		4.54
Indirect Permanent Impacts on Waters of the U.S. (aquatic communities) (acres) ^{c,e,f}										
North-South Alignment	53.97/54.00	75.35		53.48	72.28	66.43/ 65.46	70.15/ 69.18	61.69/ 60.72		63.55/62.58
With Ave 24	80.10	90.11		NA	87.64	87.82	91.55	83.09		84.95
With Ave 21	78.02	NA		71.51	NA	88.22	91.94	83.48		85.34
Indirect Permanent Impacts on Vernal Pools and Seasonal Wetlands (acres) ^{b,e,f}										
North-South Alignment	2.72/1.68	1.47		12.29	9.45	37.54/ 37.30	40.70/ 40.47	34.81/ 34.57		41.74/41.50
With Ave 24	1.91	1.47		NA	9.45	38.61	41.77	35.88		42.80
With Ave 21	2.98	NA		12.63	NA	40.54	43.71	37.81		44.74

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			
	East Chowchilla Design Option	West Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	Mariposa Way Design Options	East of Le Grand	Le Grand	Mission Ave Design Options
Indirect Permanent Impacts on Great Valley Mixed Riparian and other Riparian Communities (acres)										
North-South Alignment	17.62/17.51	31.02		17.32	28.32	28.14/27.97	28.02/27.85	16.98/16.81	17.33/17.16	
With Ave 24	44.26	49.33		NA	46.54	39.69	39.56	28.52	28.87	
With Ave 21	21.77	NA		21.24	NA	32.45	32.33	21.28	21.64	
Number of Conservation Areas Affected (Camp Pashayan, Great Valley Mitigation Bank)										
North-South Alignment	1	1		1	1	2	2	2	2	
With Ave 24	1	1		NA	1	2	2	2	2	
With Ave 21	1	NA		1	NA	2	2	2	2	
Miles of Wildlife Crossings Traversed within Eastman Lake-Bear Creek ECA										
North-South Alignment	4.1	3.6		4.1	3.6	6.8	6.1	6.8	6.4	
With Ave 24	4.1	3.6		NA	3.6	6.8	6.1	6.8	6.4	
With Ave 21	4.1	NA		4.1	NA	6.8	6.1	6.8	6.4	
HYDROLOGY AND WATER RESOURCES – NO SIGNIFICANT IMPACTS										
GEOLOGY, SOILS, AND SEISMICITY – NO SIGNIFICANT IMPACTS										
HAZARDOUS MATERIALS AND WASTES										
Construction-Period Impacts										

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options							
	UPRR/SR 99 Alternative		Hybrid Alternative		BNSF Alternative			
					Mariposa Way Design Options		Mission Ave Design Options	
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand
Use of Extremely Hazardous Materials within 0.25 Mile of a School								
North-South Alignment	15	15	12	12	13	12	13	12
With Ave 24	15	15	NA	12	13	12	13	12
With Ave 21	15	NA	12	NA	13	12	13	12
Project Impacts - No differentiating significant project impacts between alternatives								
SAFETY AND SECURITY								
Construction-Period Impacts -- No differentiating significant construction-period impacts between alternatives								
Project Impacts								
Conflicts with Correctional Facilities								
North-South Alignment	0	0	0	0	0	0	0	0
With Ave 24	0	0	NA	0	1	1	1	1
With Ave 21	0	NA	0	NA	0	0	0	0
SOCIOECONOMICS, COMMUNITIES, AND ENVIRONMENTAL JUSTICE -- NO DIFFERENTIATING SIGNIFICANT IMPACTS								
STATION PLANNING, LAND USE, AND DEVELOPMENT -- NO SIGNIFICANT IMPACTS								
AGRICULTURAL LANDS								
Construction-Period Impacts -- No differentiating significant construction-period impacts between alternatives								

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			Mission Ave Design Options
							Mariposa Way Design Options			
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand			
Project Impacts										
Important Farmlands ⁹ Affected (acres)										
North-South Alignment	538	802	754	1,116	842	865	886	872		
With Ave 24	1,027	1,111	NA	1,426	1,439	1,462	1,483	1,469		
With Ave 21	1,149	NA	1,273	NA	1,417	1,441	1,462	1,448		
Williamson Act Land Affected (acres)										
North-South Alignment	77	113	160	224	222	290	190	215		
With Ave 24	130	176	NA	285	421	488	389	413		
With Ave 21	270	NA	321	NA	479	546	446	471		
Farmland Security Zone Land Affected (acres)										
North-South Alignment	10	60	10	63	9	9	9	9		
With Ave 24	50	87	NA	99	34	34	34	34		
With Ave 21	61	NA	33	NA	29	29	29	29		
PARKS, RECREATION, AND OPEN SPACE										
Construction-Period Impacts										
Number of Parks Affected by Full or Partial Closure During Construction-Period										

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

HST Alternatives and Design Options									
North-South Alignment Isolated and with Wye Design Option	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative		
							Mariposa Way Design Options		Mission Ave Design Options
	East Chowchilla Design Option	West Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand
North-South Alignment	4-5	4-5		1	1	1	1	1	1
With Ave 24	4-5	4-5		NA	1	1	1	1	1
With Ave 21	4-5	NA		1	NA	1	1	1	1
Project Impacts									
Number of Parks Affected by Full or Partial Acquisition During Operations									
North-South Alignment	3	3		1	1	1	1	1	1
With Ave 24	3	3		NA	1	1	1	1	1
With Ave 21	3	NA		1	NA	1	1	1	1
VISUAL AND AESTHETIC RESOURCES									
Construction-Period Impacts – No differentiating significant construction-period impacts between alternatives									
Project Impacts									
Number of Landscape Units with Decreased Visual Quality and Significant Impacts.									
North-South Alignment	2	2		1	1	4	4	4	4
With Ave 24	3	3		NA	2	5	5	5	5
With Ave 21	3	NA		2	NA	5	5	5	5

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options									
	UPRR/SR 99 Alternative			Hybrid Alternative			BNSF Alternative			
							Mariposa Way Design Options		Mission Ave Design Options	
	East Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Le Grand	East of Le Grand	Le Grand	East of Le Grand		
CULTURAL AND PALEONTOLOGICAL RESOURCES										
Construction-Period Impacts										
Number of Prehistoric and Historic-era Archaeological Resources Affected During Construction-Period										
North-South Alignment	8	8	6	6	4	4	4	4	4	4
With Ave 24	8	9	NA	7	5	5	5	5	5	5
With Ave 21	8	NA	6	NA	4	4	4	4	4	4
Number of Historically Significant Built-Environment Resources Affected During Construction-Period										
North-South Alignment	13	13	11	11	11	11	11	11	11	11
With Ave 24	14	14	NA	12	12	12	12	12	12	12
With Ave 21	14	NA	12	NA	12	12	12	12	12	12
Project Impacts										
Number of Historically Significant Built-Environment Resources Affected During Operation										
North-South Alignment	1	1	1	1	1	1	1	1	1	1
With Ave 24	1	1	NA	1	1	1	1	1	1	1
With Ave 21	1	NA	1	NA	1	1	1	1	1	1
REGIONAL GROWTH – NO SIGNIFICANT IMPACTS										

Table S-4, Continued
Impacts That Differentiate Among North-South HST Alternatives and Design Options

North-South Alignment Isolated and with Wye Design Option	HST Alternatives and Design Options							
	UPRR/SR 99 Alternative			Hybrid Alternative		BNSF Alternative		
	East Chowchilla Design Option	West Chowchilla Design Option	West Chowchilla Design Option	East Chowchilla Design Option	West Chowchilla Design Option	Mariposa Way Design Options	Mission Ave Design Options	
						Le Grand	East of Le Grand	East of Le Grand
<p>^a Biological resources effects are based on habitat- level evaluation because surveys were only conducted on properties where access was permitted. Habitat-level evaluations are conservative because they present potentially suitable habitat.</p> <p>^b Does not include calculations for open waters</p> <p>^c Does not include calculations for vernal pools and seasonal wetlands</p> <p>^d Values for the north-south alignment are different depending on which wye alternative is selected. The value for both potential options is presented in this format: North-South (Ave 21)/North-South (Ave 24).</p> <p>^e Direct temporary effect calculations include the following Waters of the U.S. (aquatic communities): freshwater marsh, palustrine forested wetlands, natural watercourses, constructed water courses and constructed basins. Impacts to vernal pools, seasonal wetlands, and open waters are considered permanent by USACE.</p> <p>^f All aquatic communities, vernal pools, and seasonal wetlands, are assumed to be federally jurisdictional waters (Waters of the US) in the EIR/EIS and were evaluated as such by USACE and EPA under Section 404(b)(1) of the Clean Water Act.</p> <p>^g Important Farmlands includes Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance</p>								

Table S-5
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measure	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
TRANSPORTATION					
Construction-Period Impacts – NONE					
Project Impacts					
TR#1: Permanent road closures.	19 to 28	28 to 42	30 to 36	TR-MM#1: Access maintenance for property owners.	Less than significant
TR#2: Existing plus Project Fresno Area between Herndon Avenue and Shaw Avenue intersection impacts.	X	X	X	TR-MM#4, TR-MM#7, TR-MM#8: These mitigation measures propose to improve intersections, traffic lights, and lane movement.	Less than significant
TR#2: Future (2035) plus Project Fresno Area between Herndon Avenue and Shaw Avenue intersection impacts.	X	X	X	TR-MM#3, TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8, TR-MM#10: These mitigation measures propose to improve intersections, traffic lights, and lane movement.	Less than significant
TR#3: Future (2035) plus Project Fresno Area between Herndon Avenue and Shaw Avenue roadway impacts.	X	X	X	TR-MM#11: Add lanes to the segment.	Less than significant
TR #4: Future (2035) plus Project Fresno Area between McKinley Avenue and SR 180 Roadway Impacts.	X	X	X	TR MM#11: Add Lanes to the Segment.	Less Than Significant
TR #5: Existing plus Project Fresno Area between McKinley Avenue and SR 180 Intersection Impacts.	X	X	X	TR MM#4: Add Signal to Intersection to Improve Level of Service/Operation	Less Than Significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
TR #5: Future (2035) plus Project Fresno Area between McKinley Avenue and SR 180 Intersection Impacts.	X	X	X	TR MM#4, TR MM#7, TR MM#8: These mitigation measures propose to improve intersections, traffic lights, and lane movement.	Less Than Significant
TR#6: Future (2035) plus Project SR 99 relocation freeway impacts.	X	X	X	TR-MM#2: Add southbound auxiliary lane to SR 99.	Less than significant
TR#7: Existing plus Project SR 99 relocation intersection impacts.	X	X	X	TR-MM#4, TR-MM#5, TR-MM#7, TR-MM#8: These mitigation measures propose to add traffic lights, improve intersections, and add exclusive turn lanes.	Less than significant
TR#7: Future (2035) plus Project SR 99 relocation intersection impacts.	X	X	X	TR-MM#4, TR-MM#5, TR-MM#7, TR-MM#8: These mitigation measures propose to add traffic lights, improve intersections, and add exclusive turn lanes.	Less than significant
TR#8: Existing plus Project HST Station area roadway impacts.	X	X	X	TR-MM#11: Add lanes to the segment.	Less than significant
TR#8: Future (2035) plus Project HST Station area roadway impacts.	X	X	X	TR-MM#11: Add lanes to the segment.	Less than significant
TR#9: Existing plus Project HST Station area intersection impacts.	X	X	X	TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8: These mitigation measures propose to improve intersections and modify stops, traffic lights, and lane movement.	Less than significant
TR#9: Future (2035) plus Project HST Station area intersection impacts.	X	X	X	TR-MM#3, TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8, TR-MM#9: These mitigation measures propose to improve intersections and modify stops, traffic lights, and lane movement.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
AIR QUALITY AND GLOBAL CLIMATE CHANGE					
Construction-Period Impacts					
AQ#1: Construction of the HST alternatives would exceed the CEQA emissions thresholds for VOC and NO _x . Therefore, it could potentially cause violations of NO ₂ and O ₃ air quality standards or contribute substantially to NO ₂ and O ₃ existing or projected air quality violations.	X	X	X	AQ-MM#1, AQ-MM#2, AQ-MM#3,,AQ-MM#4, These mitigation measures would reduce emissions, potential impacts of concrete batch plants, and offset emissions through the VERA Program .	Less than significant
AQ#2: Material hauling outside the SJVAB would exceed CEQA emission thresholds for NO _x in the BAAQMD and the SCAQMD for certain hauling scenarios. This could potentially cause violations of NO ₂ and O ₃ air quality standards or contribute substantially to NO ₂ and O ₃ existing or projected air quality violations in those air districts.	X	X	X	AQ-MM#2, AQ-MM#5: These mitigation measures would reduce criteria exhaust emissions and offset emissions.	Less than significant
AQ#3: Construction of the HST alternatives would exceed the CEQA emissions thresholds for VOC and NO _x . Therefore, it would conflict with the 1-hour Ozone Attainment Plan and the 8-hour Ozone Attainment Plan.	X	X	X	AQ-MM#1, AQ-MM#2, AQ-MM#4: These mitigation measures would reduce construction-related emissions and offset emissions through the VERA Program.	Less than significant
AQ#4: Construction of the alignment may expose sensitive receptors to temporary substantial pollutant	X	X	X	AQ-MM#3: Reduce the potential impact of concrete batch plants.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
concentrations from concrete batch plants.					
Project Impacts - NONE					
NOISE AND VIBRATION					
Construction-Period Impacts					
N&V#1: Construction noise. ^a	X	X	X	N&V-MM#1: Construction noise mitigation measures.	Less than significant
N&V#2: Construction vibration. ^b	X	X	X	N&V-MM#2: Construction vibration mitigation measures.	Less than significant
Project Impacts					
N&V#3: Severe operational noise impacts.	X	X	X	N&V-MM#3, N&V-MM#4, N&V-MM#5, N&V-MM#6: These mitigation measures would reduce operational noise of project components.	Significant in some locations as decided in coordination with local communities that would prefer not to have sound barriers or would prefer lower barriers, and significant where barriers are not fully effective at reducing noise to moderate Less than significant where implementation of one or more measures reduces noise to moderate
N&V#4: Operational vibration impacts.	0	0-1	0	N&V-MM#7: Implement noise and vibration mitigation guidelines.	Significant if mitigation is not feasible based on cost-benefit criteria
ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE					
Construction-Period Impacts – NONE					
Project Impacts – NONE					
PUBLIC UTILITIES AND ENERGY					
Construction-Period Impacts – NONE					

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Project Impacts					
PUE#1: Conflicts with existing substations.	0-1	1-2	1-2	PUE-MM#1, PUE-MM#2: These mitigation measures propose to redesign project features to avoid a substation and move an existing substation.	Less than significant
BIOLOGICAL RESOURCES AND WETLANDS					
Construction Impacts					
Plant Communities and Land Cover Types					
Bio#1: Construction of the HST alternatives would introduce noxious weeds.	X	X	X	Bio-MM#4, Bio-MM#5: These mitigation measures propose to prepare weed control and biological resources management plans.	Less than significant
Bio#2: Construction of the HST alternatives would disturb Great Valley mixed riparian forest and other riparian habitat.	X	X	X	Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#15: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; manage construction activities (including reduce dust and manage stormwater); delineate sensitive areas; and restore temporary impacts.	Less than significant
Special-Status Plants					
Bio#3: Construction of the HST alternatives would disturb suitable habitat that has the potential to support special-status plant species.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#14, Bio-MM#16, Bio-MM#17 : These mitigation measures propose to manage construction activities (including reduce dust and manage stormwater); prepare/implement weed control, biological resources, and restoration and revegetation plans; delineate sensitive areas; and identify, salvage, and relocate or	Less than Significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
				propagate special-status plants.	
Special-Status Wildlife – Invertebrates					
Bio#4: Construction of the HST alternatives would disturb suitable habitat that has the potential to support vernal pool branchiopods.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#14, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#45: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; manage construction activities (including reduce dust and manage stormwater); delineate sensitive areas; monitor and restore impacts on jurisdictional waters; and reduce impacts on vernal pools.	Less than Significant
Bio#5: Construction of the HST alternatives would disturb suitable habitat that has the potential to support the valley elderberry longhorn beetle.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#11, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#21: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; delineate sensitive areas; manage construction activities (including reduce dust and manage stormwater); prevent entrapment; and implement conservation guidelines.	Less than significant
Special-Status Wildlife – Amphibians					
Bio#6: Construction of the HST alternatives would disturb California tiger salamander habitat.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#9, Bio-MM#10, Bio-MM#11, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#15, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#22, Bio-MM#23,	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
				Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; delineate sensitive areas; manage construction activities (including reduce dust and manage stormwater); prevent entrapment; reduce impacts on vernal pools; erect amphibian exclusion fencing; restore temporary impacts; monitor and restore impacts on jurisdictional waters; and translocate the California tiger salamander.	
Bio#7: Construction of the HST alternatives would disturb western spadefoot toad habitat.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#9, Bio-MM#10, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#15, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#23, Bio-MM#24, Bio-MM#43, Bio-MM#45: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; delineate sensitive areas; monitor and restore impacts on jurisdictional waters; manage construction activities (including reduce dust and manage stormwater); protect vernal pools; restore temporary impacts; erect amphibian exclusion fencing; and conduct surveys for western spadefoot toad.	Less than significant
Special-Status Wildlife – Reptiles					
Bio#8: Construction of the HST alternatives would disturb habitat that supports the western pond turtle.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#15, Bio-MM#24, Bio-MM#25, Bio-MM#26,	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
				Bio-MM#43, Bio-MM#44, Bio-MM#51: These mitigation measures propose to prepare biological resources and restoration and revegetation plans; delineate sensitive areas; restore temporary impacts; manage construction activities (including reduce dust and manage stormwater);; monitor and restore impacts on jurisdictional waters; survey, monitor, and relocate; western pond turtles; and implement mitigation measures for western pond turtle.	
Special-Status Wildlife – Fish					
Bio#9: Construction of the HST alternatives would disturb special-status fish due to the potential for turbidity, sediment deposition, and noise exposure.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#14, Bio-MM#15, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare a biological resources management plan; delineate sensitive areas; manage construction activities (including manage stormwater); monitor and restore impacts on jurisdictional waters; and restore temporary impacts.	Less than significant
Special-Status Wildlife – Birds and Raptors					
Bio#10: Construction of the HST alternatives would disturb nesting Swainson's hawk.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#28, Bio-MM#30, Bio-MM#31, Bio-MM#32, Bio-MM#33: These mitigation measures propose to prepare a biological resources management plan, manage construction activities (including reduce dust and manage stormwater);, delineate sensitive areas, require pre-construction surveys, protect	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
				raptors on power lines, monitor removal of nest trees, and avoid nests.	
Bio#11: Construction of the HST alternatives would disturb breeding birds, including raptors.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#28, Bio-MM#29, Bio-MM#30: These mitigation measures propose prepare a biological resources management plan, manage construction activities (including reduce dust and manage stormwater);, require pre-construction surveys, protect raptors on power lines, and establish buffers to avoid nest abandonment.	Less than significant
Bio#12: Construction of the HST alternatives would disturb or cause the loss of burrowing owls and their habitat.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#13, Bio-MM#14, Bio-MM#34, Bio-MM#35: These mitigation measures propose to prepare a biological resources management plan, delineate sensitive areas, manage construction activities (including reduce dust and manage stormwater); require protocol surveys for burrowing owls, and avoid burrowing owls.	Less than significant
Special-Status Wildlife – Mammals					
Bio#13: Construction of the HST alternatives would disturb breeding or nonbreeding bats.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#36, Bio-MM#37, Bio-MM#38: These mitigation measures propose to prepare a biological resources management plan, delineate sensitive areas, manage construction activities, conduct pre-construction surveys, and reduce impacts on bat species.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Bio#14: Construction of the HST alternatives would disturb American badger dens.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#11, Bio-MM#12, Bio-MM#39, Bio-MM#40, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare biological resources and restoration and revegetation plans, delineate sensitive areas, manage construction activities, prevent entrapment, conduct pre-construction surveys, avoid impacts on American badgers, and monitor and restore impacts on jurisdictional waters.	Less than significant
Bio#15: Construction of the HST alternatives would disturb San Joaquin kit fox dens.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#11, Bio-MM#12, Bio-MM#13, Bio-MM#14, Bio-MM#41, Bio-MM#42, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare a biological resources management plan, delineate sensitive areas, manage construction activities, prevent entrapment, monitor and restore impacts on jurisdictional waters, conduct pre-construction surveys, and reduce impacts on San Joaquin kit fox.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Habitats of Concern					
Special-Status Plant Communities					
Bio#16: Construction of the HST alternatives would temporarily convert special-status plant communities (e.g., Great Valley mixed riparian forest, coastal and valley freshwater marsh, vernal pools).	X	X	X	Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#15, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; delineate sensitive areas; manage construction activities (including reduce dust and manage stormwater); delineate sensitive areas; reduce impacts on vernal pools; monitor and restore impacts on jurisdictional waters; conduct pre-construction surveys; and restore temporary impacts.	Less than significant
Jurisdictional Waters					
Bio#17: Construction of the HST alternatives would have indirect impacts on jurisdictional waters.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#15, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare weed control, biological resources, and restoration and revegetation plans; manage construction activities (including reduce dust and manage stormwater); restore impacts on jurisdictional waters; conduct pre-construction surveys; reduce impacts on vernal pools; and restore temporary impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Critical Habitat					
Bio#18: Construction of the HST alternatives would disturb critical habitat.	X	X	X	Bio-MM#3, Bio-MM#4, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#14, Bio-MM#15, Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare biological resources, weed control, and restoration and revegetation plans; manage construction activities (including reduce dust and manage stormwater); delineate sensitive areas; monitor and restore impacts on jurisdictional waters; conduct pre-construction surveys; restore temporary impacts; reduce impacts on vernal pools; and identify, salvage, and relocate or propagate special-status plants.	Less than significant
Essential Fish Habitat					
Bio#19: Construction of the HST alternatives would disturb Essential Fish Habitat.	X	X	X	Bio-MM#3, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#14, Bio-MM#15, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare biological resources and restoration and revegetation plans, manage construction activities (including reduce dust and manage stormwater); delineate sensitive areas, monitor and restore impacts on jurisdictional waters, and restore temporary impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Mitigation Banks/Reserves					
Bio#20: Construction of the BNSF Alternative would disturb portions of the Great Valley Conservation Bank.		X		Bio-MM#3, Bio-MM#5, Bio-MM#6, Bio-MM#7, Bio-MM#8, Bio-MM#10, Bio-MM#15, Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44: These mitigation measures propose to prepare biological resources and restoration and revegetation plans; manage construction activities; delineate sensitive areas; conduct pre-construction surveys; identify, salvage, and relocate or propagate special-status plants; monitor and restore impacts on jurisdictional waters; reduce impacts on vernal pools; and restore temporary impacts.	Less than significant
Bio#21: Construction of the HST alternatives would disturb Camp Pashayan (San Joaquin River Ecological Reserve).	X	X	X	Bio-MM#15, Bio-MM#16, Bio-MM#17, Bio-MM#18, Bio-MM#19, Bio-MM#20, Bio-MM#43, Bio-MM#44, PK-MM#4: These mitigation measures propose to restore temporary impacts; conduct pre-construction surveys; reduce impacts on vernal pools; identify, salvage, and relocate or propagate special-status plants; monitor and restore impacts on jurisdictional waters; and acquire property for Camp Pashayan.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Project Impacts					
Plant Communities and Land Cover Types					
Bio#22: Project impacts from the HST alternatives would permanently convert Great Valley mixed riparian forest and other riparian habitat. (Coastal Valley Freshwater Marsh and vernal pools addressed in Bio#37).	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant
Special-Status Plant Species					
Bio#23: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status plant species.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#28, Bio-MM#48, Bio-MM#49, Bio-MM#55, Bio-MM#56, Bio-MM#58: These mitigation measures propose to prepare weed control plan and habitat mitigation and monitoring plans, manage construction activities, implement conservation guidelines, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Significant
Special-Status Wildlife – Invertebrates					
Bio#24: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support vernal pool branchiopods.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Bio#25: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support valley elderberry longhorn beetle.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#49, Bio-MM#58: These mitigation measures propose to prepare a weed control plan, manage construction activities, implement conservation guidelines, and restore and preserve offsite habitat.	Less than significant
Special-Status Wildlife – Amphibians					
Bio#26: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support California tiger salamander.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#50, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant
Bio#27: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support western spadefoot toad.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#24, Bio-MM#50, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, conduct surveys for western spadefoot toad, and compensate for permanent impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Special-Status Wildlife – Reptiles					
Bio#28: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support western pond turtle.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#51, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, implement western pond turtle mitigation, and compensate for permanent impacts.	Less than significant
Special-Status Wildlife – Fish					
Bio#29: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status fish.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant
Special-Status Wildlife – Birds and Raptors					
Bio#30: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support nesting Swainson’s hawk.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#49, Bio-MM#52, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Bio#31: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support burrowing owls.	X	X	X	Bio-MM#14, Bio-MM#53: These mitigation measures propose to manage construction activities and compensate for permanent impacts.	Less than significant
Bio#32: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support breeding birds, including raptors and burrowing owls.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#52, Bio-MM#53, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, and restore and preserve offsite habitat.	Less than significant
Special-Status Wildlife – Mammals					
Bio#33: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support special-status bats.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Bio#34: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support American badger dens.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58, N&V-MM#3: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans; manage construction activities; delineate jurisdictional waters; restore and preserve offsite habitat; conduct wildlife corridor monitoring; compensate for permanent impacts; and implement proposed California High-Speed Train Project Noise and Vibration Mitigation Guidelines.	Less than significant
Bio#35: Project impacts from the HST alternatives would permanently convert suitable habitat that has the potential to support San Joaquin kit fox dens.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#54, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58, N&V-MM#3: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans; manage construction activities; delineate jurisdictional waters; restore and preserve offsite habitat; conduct wildlife corridor monitoring; compensate for permanent impacts; and implement proposed California HST Project noise and vibration mitigation guidelines..	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Habitats of Concern					
Special-Status Plant Communities					
Bio#36: Project impacts from the HST alternatives would permanently convert special-status plant communities. (Great Valley Mixed Riparian and other riparian addressed in Bio#23.)	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#47, Bio-MM#49, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, implement conservation guidelines, and compensate for permanent impacts.	Less than significant
Jurisdictional Waters					
Bio#37: Project impacts from the HST alternatives would permanently convert jurisdictional waters.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#49, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant
Critical Habitat					
Bio#38: Project impacts from the HST alternatives would include critical habitat for vernal pool species.	X	X	X	Bio-MM#4, Bio-MM#14, Bio-MM#49, Bio-MM#50, Bio-MM#57, Bio-MM#58, Bio-MM#59, Bio-MM#60: These mitigation measures propose to prepare weed control and habitat mitigation and monitoring plans, manage construction activities, delineate jurisdictional waters, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Essential Fish Habitat					
Bio#39: Project impacts from the HST alternatives would require construction in Essential Fish Habitat.	X	X	X	Bio-MM#14 This mitigation measure addresses impacts associated with Essential Fish Habitat.	Less than significant
Mitigation Banks/Reserves					
Bio#40: All of the HST alternatives would affect Camp Pashayan (within the San Joaquin River Ecological Reserve).	X	X	X	PK-MM#1, PK-MM#2: These mitigation measures propose to compensate for construction and permanent impacts.	Less than significant
Bio#41: Project impacts from the BNSF Alternative would affect portions of the Great Valley Conservation Bank.		X		Bio-MM#14, Bio-MM#47, Bio-MM#48, Bio-MM#55, Bio-MM#56, Bio-MM#57, Bio-MM#58, PK-MM#1, PK-MM#4: These mitigation measures propose to manage construction activities, delineate jurisdictional waters, prepare a habitat mitigation and monitoring plan, restore and preserve offsite habitat, and compensate for permanent impacts.	Less than significant
Wildlife Movement Corridors					
HYDROLOGY AND WATER RESOURCES – NONE					
GEOLOGY, SOILS, AND SEISMICITY – NONE					
HAZARDOUS MATERIALS AND WASTES					
Construction-Period Impacts					
HMW#1: Handling of extremely hazardous materials within 0.25 mile of a school.	15 schools	12 to 13 schools	12 schools	HMW-MM#1: No use of extremely hazardous substances or a mixture thereof in a quantity equal to or greater than the state threshold quantity (Health and Safety Code Section 25532) within 0.25 mile of a school.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation	
	UPRR/ SR 99	BNSF	Hybrid			
Project Impacts – NONE						
SAFETY AND SECURITY						
Construction-Period Impacts – NONE						
Project Impacts						
S&S#1: Ave 24 Wye northbound leg connecting to the BNSF Alternative (Road 21 overpass) presents security risk to correctional facilities.		X (with Ave 24 Wye)		S&S-MM#1: Revise design to avoid safety risk to correctional facilities from roadway overpass.	Less than significant	
S&S#2: Increased demand for fire, rescue, and emergency services at stations and HMF.	X	X	X	S&S-MM#2: Monitor response of local fire, rescue, and emergency service providers to incidents at stations and the HMF and provide a fair share cost of service.	Less than significant	
SOCIOECONOMICS, COMMUNITIES, AND ENVIRONMENTAL JUSTICE						
Construction-Period Impacts – NONE						
Project Impacts						
SO#3: Displacement of a community facility.	X	X	X	SO-MM#4, SO-MM#5: These mitigation measures propose to provide for the replacement of community facilities and continued outreach.	Less than significant	
STATION PLANNING, LAND USE, AND DEVELOPMENT – NONE						
AGRICULTURAL LANDS						
Construction-Period Impacts – NONE						
Project Impacts						
AG#1: Permanent conversion of agricultural land to nonagricultural use.	1,027 to 1,149 acres	1,417 to 1,483 acres	1,285 to 1,433 acres	Ag-MM#1: Preserve the total amount of prime farmland, farmland of statewide importance, farmland of local importance, and unique farmland.	Significant	
Ag#2: Permanent conversion of agricultural land from parcel splits.	X	X	X	Ag-MM#2: Consolidate non-economic remnants and create a farmland consolidation program.	Significant	

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
PARKS, RECREATION, AND OPEN SPACE					
Construction-Period Impacts					
PK#1: Sharon Avenue Linear Park (City of Madera) temporary closure.	X			PK-MM#1: Compensate for staging in park property for construction.	Significant
PK#2: Road 27¾ Park (City of Madera) construction use.	X			PK-MM#1: Compensate for staging in park property for construction.	Significant
PK#4: Vern McCullough Fresno River Trail (City of Madera) construction use	X			PK-MM#1: Compensate for staging in park property for construction.	Less than significant
PK#4: Camp Pashayan (City of Fresno).	X	X	X	PK-MM#1: Compensate for staging in park property for construction.	Significant
Project Impacts					
PK#5: Riverside Park (City of Madera).	X			PK-MM#2: Acquire park property.	Less than significant
PK#6: County Road 27¾ Linear Park (City of Madera).	X			PK-MM#2: Acquire park property.	Less than significant
PK#7: Camp Pashayan Park.	X	X	X	PK-MM#4: Acquire property for Camp Pashayan.	Less than significant
PK#8: Roeding Park (City of Fresno).	X	X	X	PK-MM#5: Address noise at Roeding Park with City of Fresno.	Less than significant
AESTHETICS AND VISUAL RESOURCES					
Construction-Period Impacts					
VQ#1: Visual disturbance during construction.	X	X	X	VQ-MM#1: Minimize visual disruption from construction.	Less than significant
VQ#2: Nighttime lighting during construction.	X	X	X	VQ-MM#2: Minimize light disturbance from construction.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Project Impacts					
VQ#3-10: Lower visual quality. Number of landscape units with decreased visual quality:	3	5	2	One or more of the following, depending on landscape unit: VQ-MM#3, VQ-MM#3a, VQ-MM#3b, VQ-MM#4, VQ-MM#5 These mitigation measures propose to screen guideways; integrate elevated guideways with parks, trails, and urban core design guidelines; provide landscaping; and incorporate design criteria.	Significant
VQ#11: Sound barrier would block views.	X	X	X	VQ-MM#5, VQ-MM#6: These mitigation measures propose to provide landscape treatments, and sound-barrier treatments.	Significant
VQ#12: Traction power distribution stations would alter the visual character or block views.	X	X	X	VQ-MM#7: Screen traction power distribution stations.	Less than significant
CULTURAL AND PALEONTOLOGICAL RESOURCES					
Construction-Period Impacts					
Arch#1: Effect on significant prehistoric and historic-era archaeological resources during construction.	8-9	4-5	6-7	Arch-MM#1, Arch-MM#2, Arch-MM#3, Arch-MM#4: These mitigation measures propose to provide for archaeological training, archaeological monitoring, a plan for preservation in- place, and would halt construction in the event of an archaeological discovery.	Less than significant

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
Pale#2: Effect on paleontological resources during construction.	Least	Most	Between UPRR/ SR 99 and BNSF	Pale-MM#1, Pale-MM#2, Pale-MM#3: These mitigation measures propose to provide for monitoring and a Paleontological Resource Monitoring and Mitigation Plan, and would halt construction if paleontological resources were found.	Less than significant
Hist#1: Effect on historically significant built-environment resources during construction. Historical resources (excludes Roeding Park):	12	11	11	Hist-MM#1, Hist-MM#2, Hist-MM#3, Hist-MM#4, Hist-MM#5, Hist-MM#6, Hist-MM#7, Hist-MM#8, Hist-MM#9, Hist-MM#10: These mitigation measures propose to avoid adverse noise and vibration effects, develop protection and stabilization measures, minimize adverse effects, prepare and submit NRHP/CRHR nominations and HABS/ HAER/ HALS documentation, prepare HRSs and interpretive exhibits, and plan repair of inadvertent damage.	Significant and unavoidable
Hist#2: Effect on historically significant built-environment resources during construction. Substantial adverse changes to Roeding Park	X	X	X	Hist-MM#1, Hist-MM#2, Hist-MM#4, Hist-MM#5, Hist-MM#6, Hist-MM#7, Hist-MM#8, Hist-MM#9, Hist-MM#10: These mitigation measures would avoid adverse noise and vibration effects, develop protection and stabilization measures, minimize adverse effects, prepare and submit NRHP/CRHR nominations and HABS/ HAER/ HALS documentation, prepare HRSs and interpretive exhibits, and plan repair of inadvertent damage	Less than significant with mitigation
Project Impacts					
Hist#3: Effect on historically significant	1	1	1	PK-MM#4, Hist-MM#4:	Less than significant with

Table S-5, Continued
Comparison of Potential Adverse Effects of HST Alternatives

Impact	HST Alternatives			Mitigation Measures	CEQA Level of Significance after Mitigation
	UPRR/ SR 99	BNSF	Hybrid		
built-environment resources during operation				These mitigation measures address noise at Roeding Park and minimize adverse noise effects.	mitigation. It is possible that the City of Fresno would view the projected noise levels as acceptable and preferable to the implementation of mitigation measures. In this case, the impacts on Roeding Park, both as a park and a historical resource, would remain significant under CEQA.
REGIONAL GROWTH - NONE					
^a Potential construction noise impacts will be evaluated during final design. ^b Potential construction vibration impacts will be evaluated during final design.					

Table S-6
HMF Alternative Differentiating Environmental Impacts

Impact	HMF Alternatives					Mitigation Measure	CEQA Level of Significance after Mitigation
	Castle Commerce Center	Harris-DeJager	Fagundes	Gordon-Shaw	Kojima Development		
TRANSPORTATION							
Construction-Period Impacts - NONE							
Project Impacts							
TR#10: Existing plus Project HMF site intersection impacts. Number of intersections:	8	1	3	1	2	TR-MM#4, TR-MM#5, TR-MM#7, TR-MM#8, TR-MM#9: These mitigation measures propose to improve intersections, traffic lights, and lane movement.	Less than significant
TR#10: Future (2035) plus Project HMF site intersection impacts. Number of intersections:	22 to 25	1	4	5	6	TR-MM#3, TR-MM#4, TR-MM#5, TR-MM#6, TR-MM#7, TR-MM#8, TR-MM#9: These mitigation measures propose to improve intersections, traffic lights, and lane movement.	Less than significant
AIR QUALITY AND GLOBAL CLIMATE CHANGE							
Construction-Period Impacts - NONE							
Project Impacts							
AQ#5: Operation of the HMF (Castle Commerce Center, Gordon-Shaw, and Kojima Development HMF sites) may expose sensitive receptors to substantial TAC pollutant concentrations. Significant for TAC.	X			X	X	AQ-MM#6: Reduce the potential impact of air toxics. AQ-MM#7: Reduce the potential impact of stationary sources.	Less than significant

Table S-6, Continued
HMF Alternative Differentiating Environmental Impacts

Impact	HMF Alternatives					Mitigation Measure	CEQA Level of Significance after Mitigation
	Castle Commerce Center	Harris-DeJager	Fagundes	Gordon-Shaw	Kojima Development		
AQ#6: Operation of the HMF may cause the total PM ₁₀ and PM _{2.5} ambient concentrations to exceed California Ambient Air Quality Standards due to the existing exceedances in the area. Significant for PM ₁₀ and PM _{2.5} .	X	X	X	X	X		
NOISE AND VIBRATION – NONE							
ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE – NONE							
PUBLIC UTILITIES AND ENERGY – NONE							
BIOLOGICAL RESOURCES AND WETLANDS							
Construction-Period Impacts - NONE							
Project Impacts - NONE							
HYDROLOGY AND WATER RESOURCES – NONE							
GEOLOGY, SOILS, AND SEISMICITY – NONE							
HAZARDOUS MATERIALS AND WASTES – NONE							
SAFETY AND SECURITY							
Construction-Period Impacts - NONE							
Project Impacts							
S&S #2: Increased demand for fire, rescue, and emergency services at stations and HMF.	X	X	X	X	X	S&S-MM#2: Monitor response of fire, rescue, and emergency service providers to incidents at stations and HMF and provide a fair share cost of service.	Less than significant

Table S-6, Continued
HMF Alternative Differentiating Environmental Impacts

Impact	HMF Alternatives					Mitigation Measure	CEQA Level of Significance after Mitigation
	Castle Commerce Center	Harris-DeJager	Fagundes	Gordon-Shaw	Kojima Development		
SOCIOECONOMICS, COMMUNITIES, AND ENVIRONMENTAL JUSTICE							
Construction-Period Impacts - NONE							
Project Impacts							
SO#1: Division of Merced Estates Mobile Home Park. The Castle Commerce Center HMF guideway would bisect an existing mobile home community, displacing approximately 50% of the homes.	X					SO-MM#2, SO-MM#3, SO-MM#5, SO-MM#6: These mitigation measures propose to prepare a relocation mitigation plan, reduce impacts associated with division of communities, continue outreach, and investigate displacement avoidance or replacement options.	Significant
SO#2: Displacement of community facilities. The guideway between the Castle Commerce Center HMF and the Downtown Merced Station would require the acquisition of three community facilities.	X					SO-MM#2, SO-MM#4, SO-MM#5: These mitigation measures propose to prepare a relocation mitigation plan, avoid or replace community facilities, and continue outreach.	Less than significant
STATION PLANNING, LAND USE, AND DEVELOPMENT – NONE							
AGRICULTURAL LANDS							
Construction-Period Impacts - NONE							
Project Impacts							
AG#1: Permanent conversion of agricultural land to non-agricultural use. Acreage converted:	110 acres	313 acres	168 acres	313 acres	246 acres	Ag-MM#1: Preserve the total amount of Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Unique Farmland.	Significant

Table S-6, Continued
HMF Alternative Differentiating Environmental Impacts

Impact	HMF Alternatives					Mitigation Measure	CEQA Level of Significance after Mitigation
	Castle Commerce Center	Harris-DeJager	Fagundes	Gordon-Shaw	Kojima Development		
PARKS, RECREATION, AND OPEN SPACE							
Construction-Period Impacts - NONE							
Project Impacts							
PK#9: Joe Stefani Elementary School.	X					PK-MM#2: Acquire park property.	Significant
AESTHETICS AND VISUAL RESOURCES – NONE							
CULTURAL AND PALEONTOLOGICAL RESOURCES – NONE							
Construction-Period Impacts							
Arch#1: Effect on significant prehistoric and historic-era archaeological resources during construction.	2				1	Arch-MM#1, Arch-MM#2, Arch-MM#3, Arch-MM#4: These mitigation measures propose to provide archaeological training, archaeological monitoring, a plan for preservation in- place, and would halt construction in the event of an archaeological discovery.	Less than significant
Project Impacts - NONE							
REGIONAL GROWTH - NONE							